



HIGHER SCHOOL OF ECONOMICS
NATIONAL RESEARCH UNIVERSITY



Inequality of Educational Opportunities

Second International Summer School

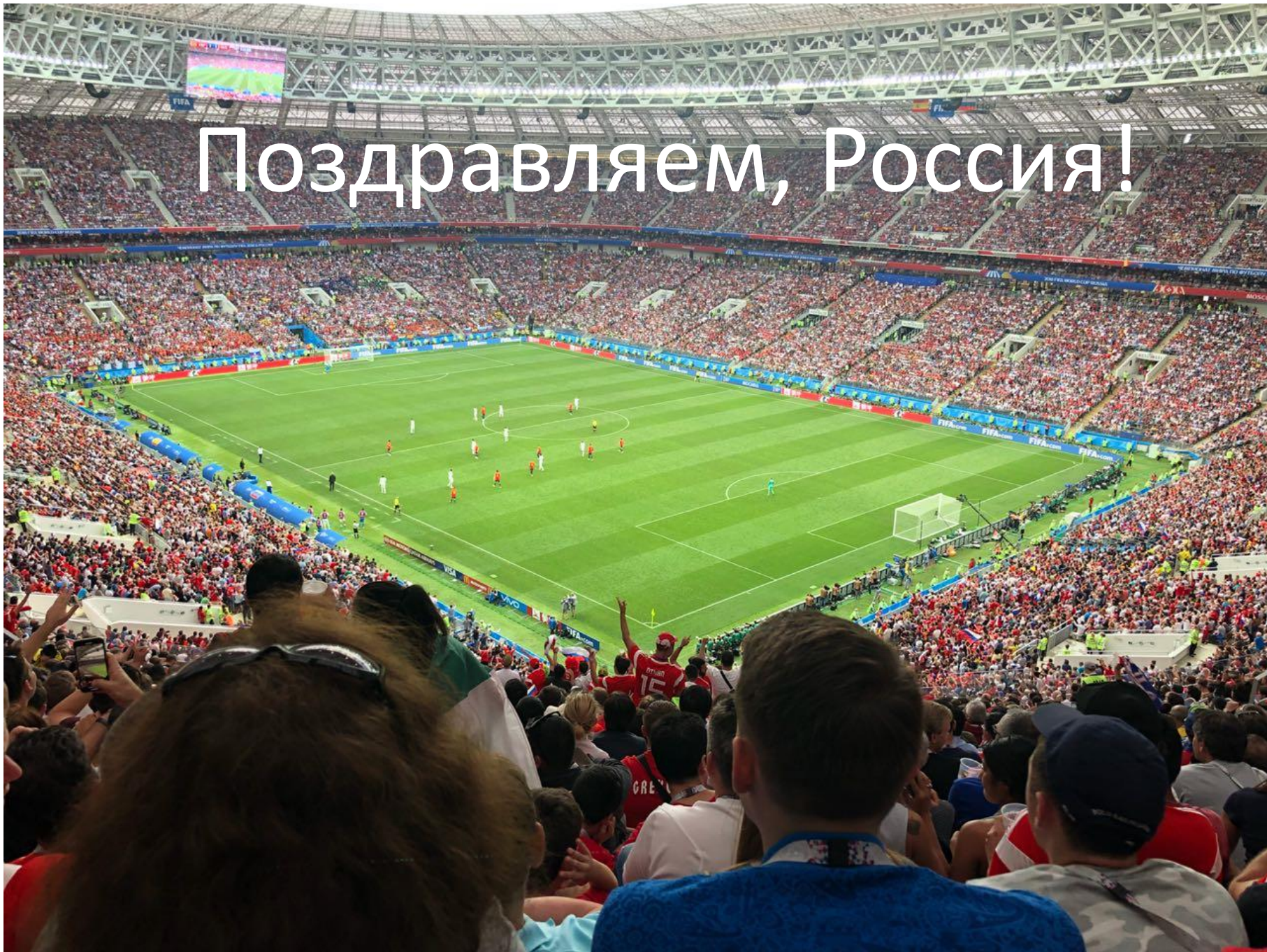
Ricardo A. Madeira

Department of Economics – University of São Paulo (USP)

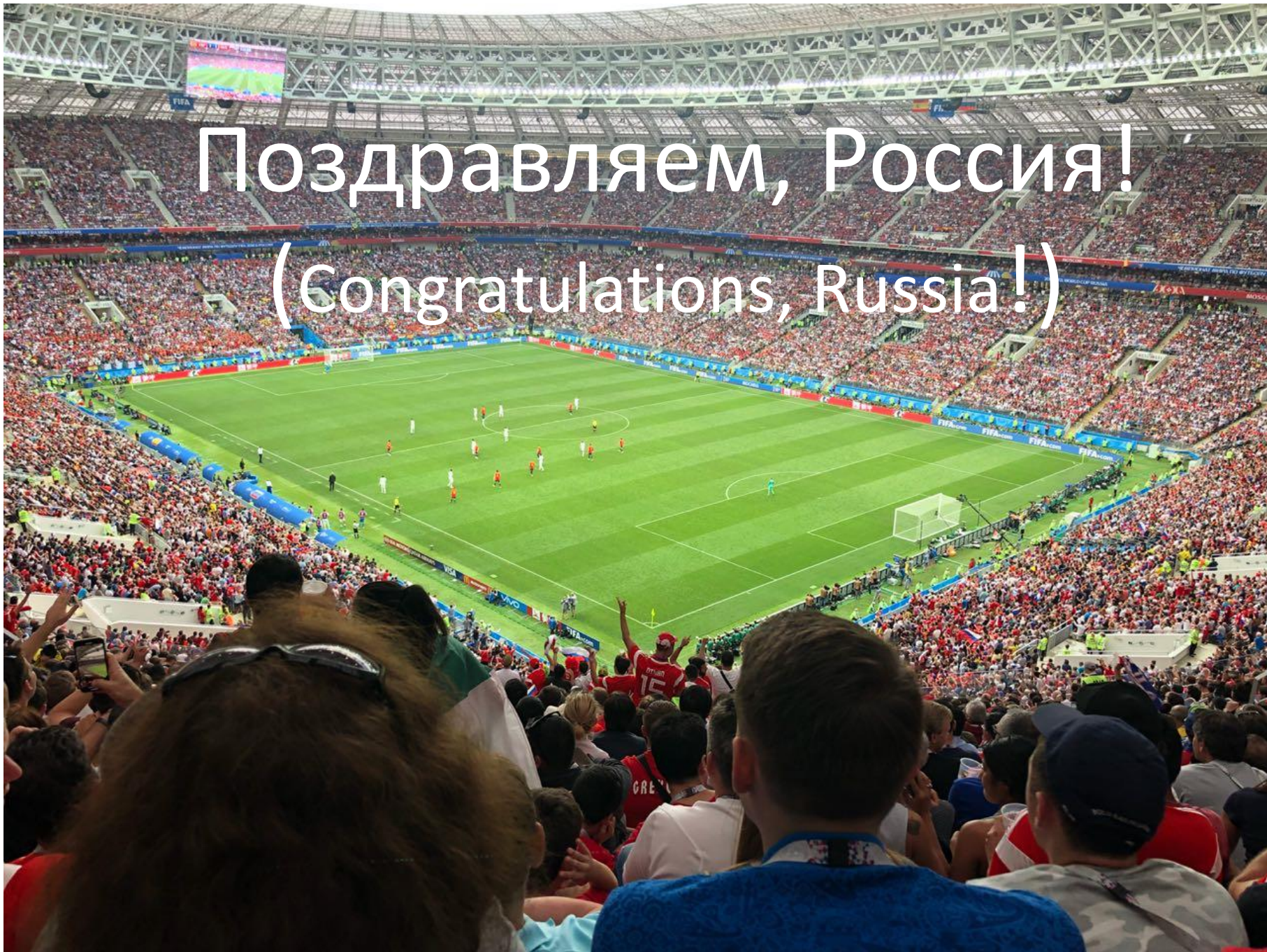
Lecture 1:

Education Inequality: Theory and Evidence

Поздравляем, Россия!



Поздравляем, Россия!
(Congratulations, Russia!)



Outline

- 1) Education inequality and welfare inequality
- 2) The school production function and potential sources of inequality
 - I. The role of the main inputs (school inputs, family inputs, social context inputs, etc...)
 - II. Dynamic factors of the production function:
 - I. social interactions, peer effects, parenting and intrahousehold allocation of resources
 - II. Social and racial stereotyping/stigma
 - III. Formal discrimination
- 3) Employing Brazilian (macro and micro) data to connect racial inequality in living standard to racial inequality in schooling
 - I. Evidence of statistical discrimination

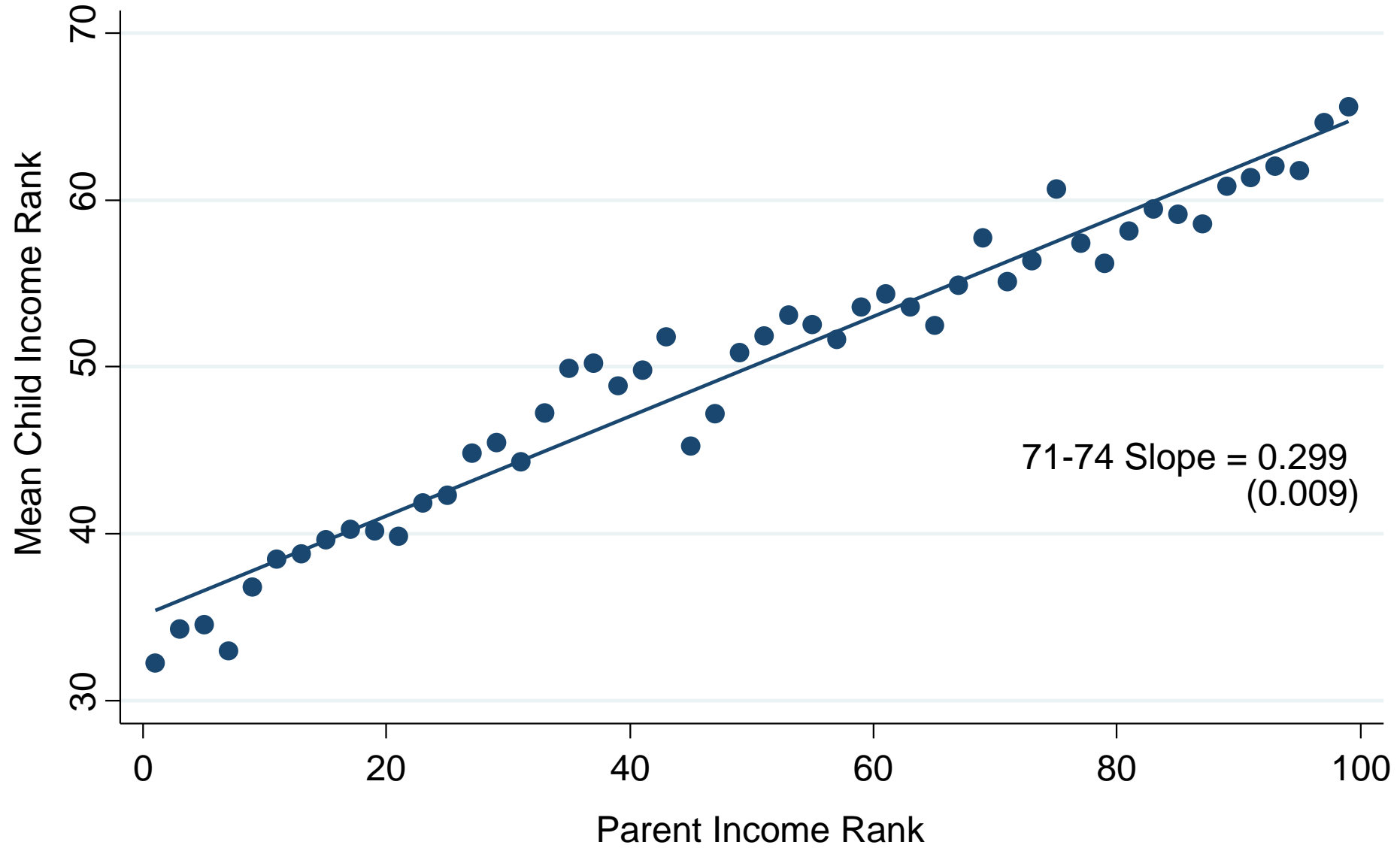
Welfare Inequality

- Differences in living standards among social and racial groups are widely documented in different contexts and societies.
 - labor market outcomes
 - Difference in earnings and employment rates
 - health outcomes
 - infant/child mortality, life expectancy and illness incidence
 - crime/violence
 - psychological and physical violence, incarceration rates

Inequality persistence

- Recent research, Chetty et al (AER 2014), has shown that economic differences are quite persistent over time
 - Part of the “*The Equality of Opportunity Project*”
 - <http://www.equality-of-opportunity.org/>
 - They use rank-rank specification as a primary measure of economic mobility
 - Rank children based on their incomes relative to other children in same birth cohort
 - Rank parents of these children based on their incomes relative to other parents in this sample
- Let’s look at their data!

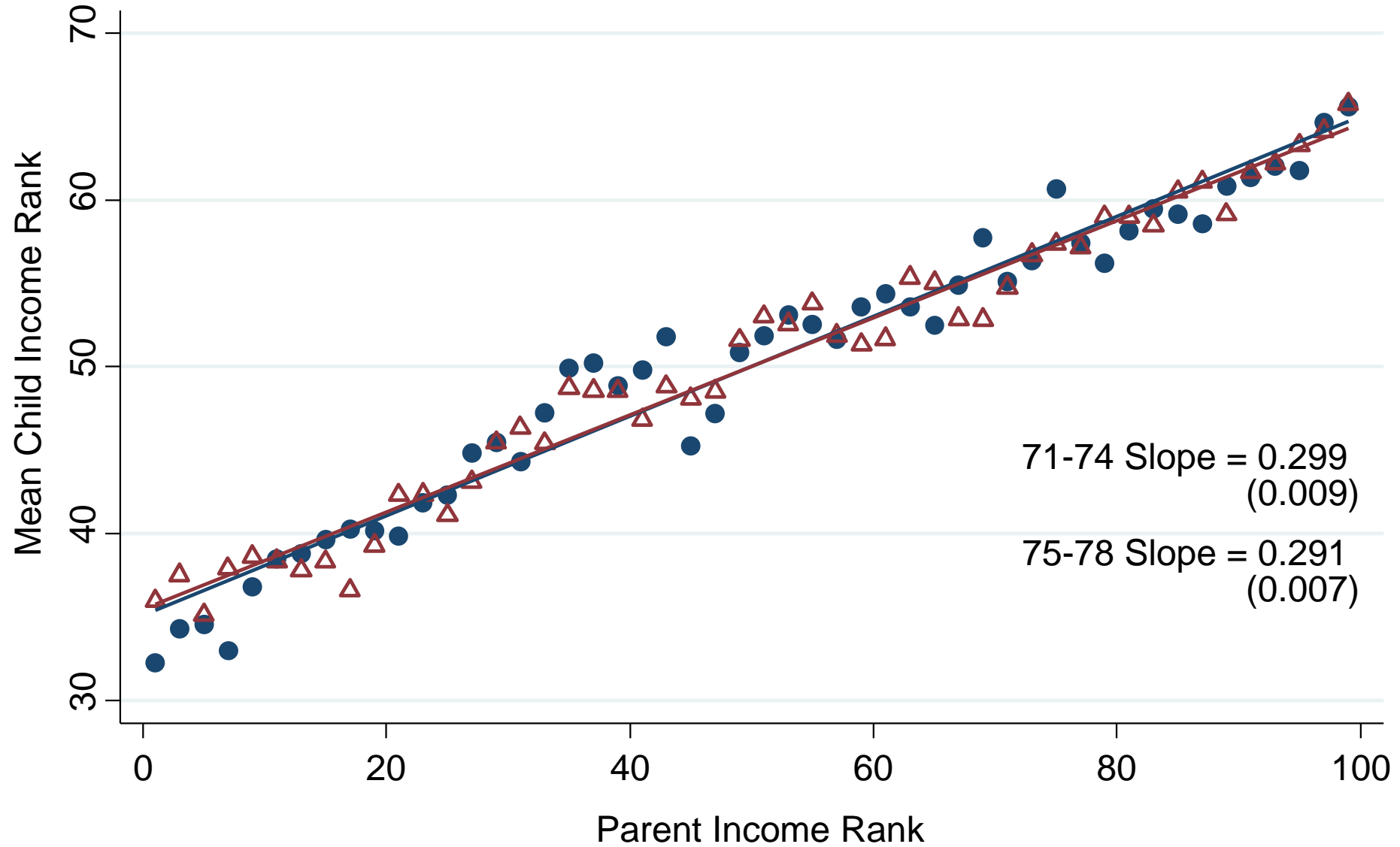
Child Income Rank vs. Parent Income Rank by Birth Cohort



71-74 Slope = 0.299
(0.009)

—●— 1971-74

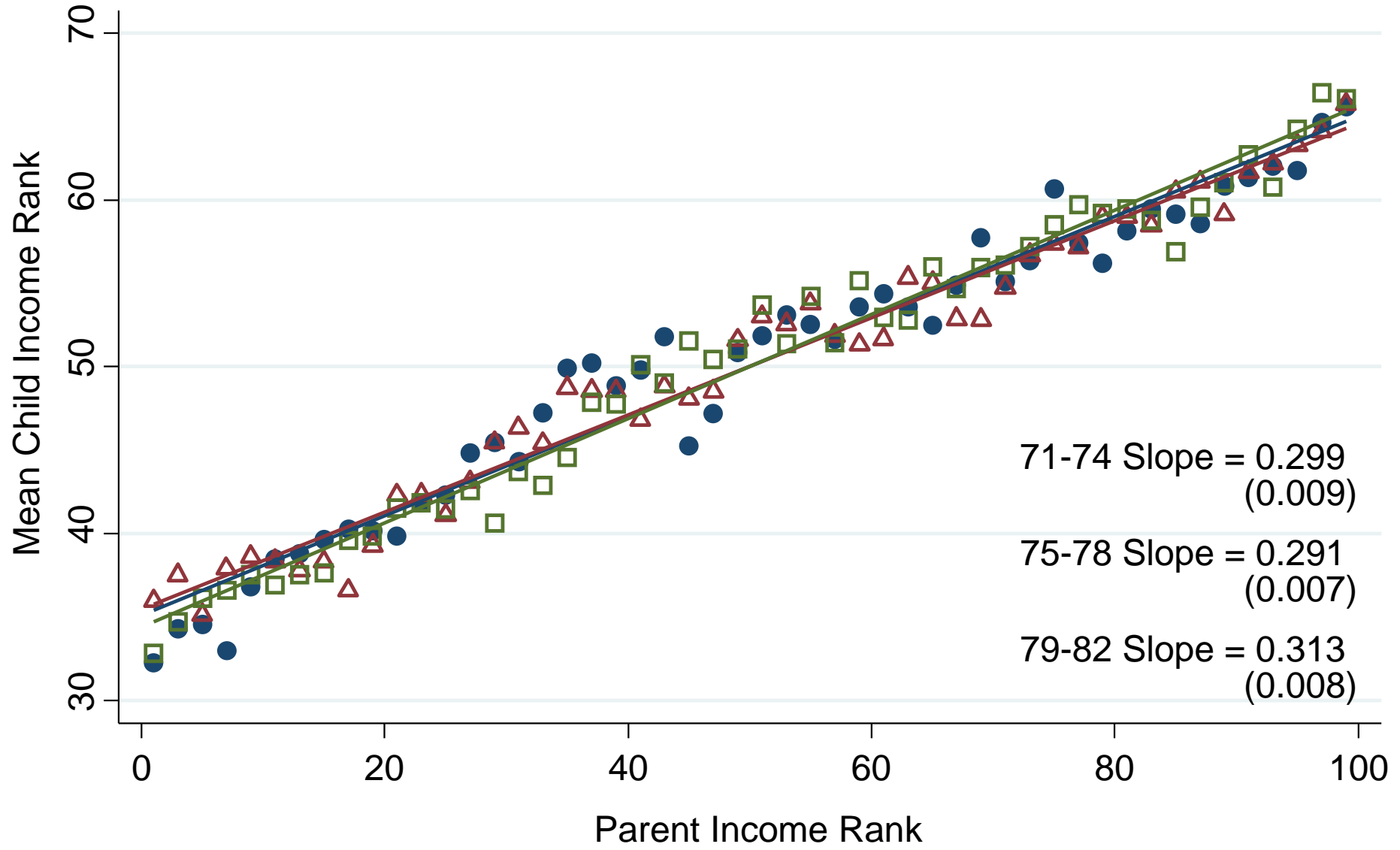
Child Income Rank vs. Parent Income Rank by Birth Cohort



● 1971-74

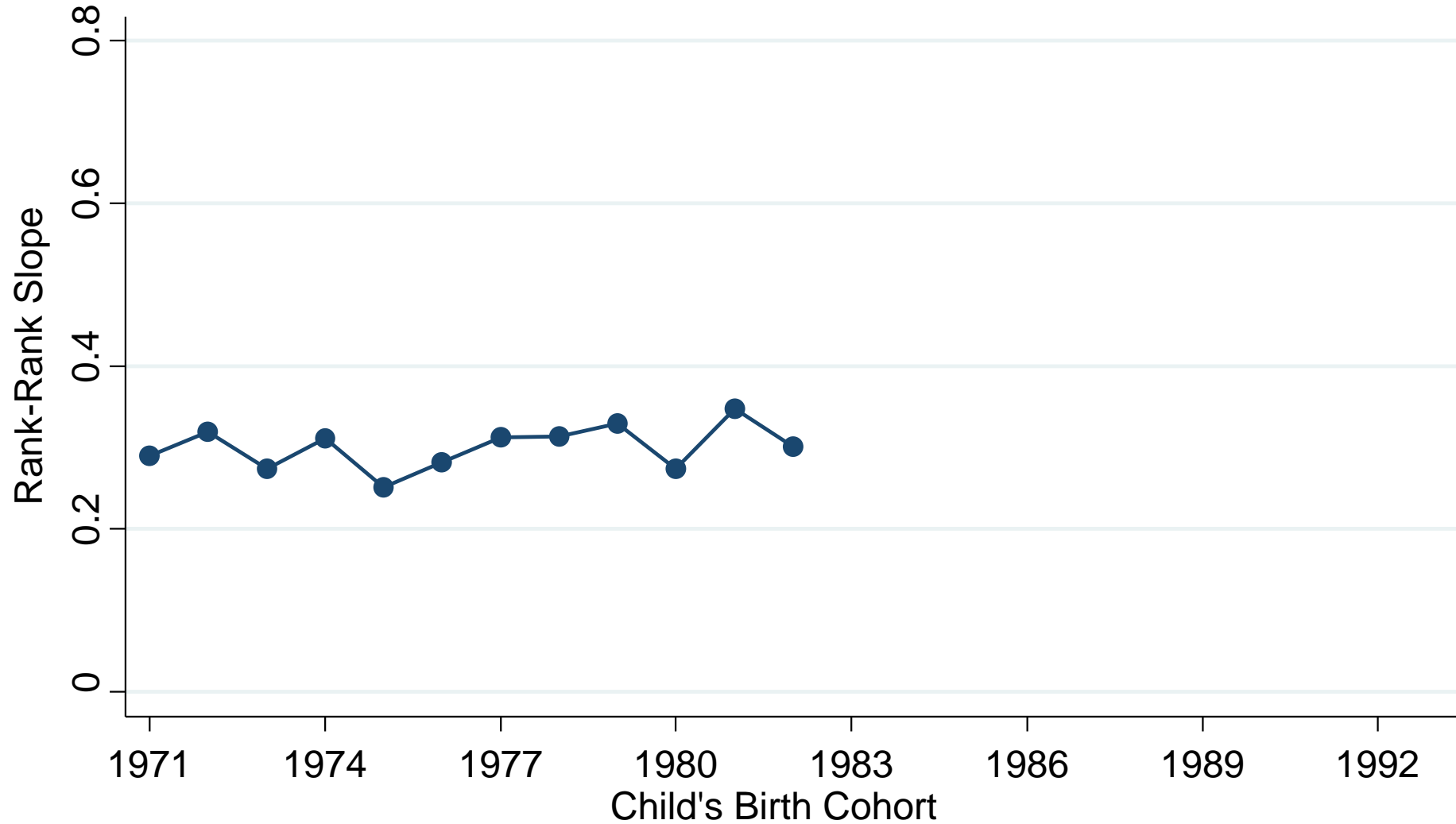
▲ 1975-78

Child Income Rank vs. Parent Income Rank by Birth Cohort



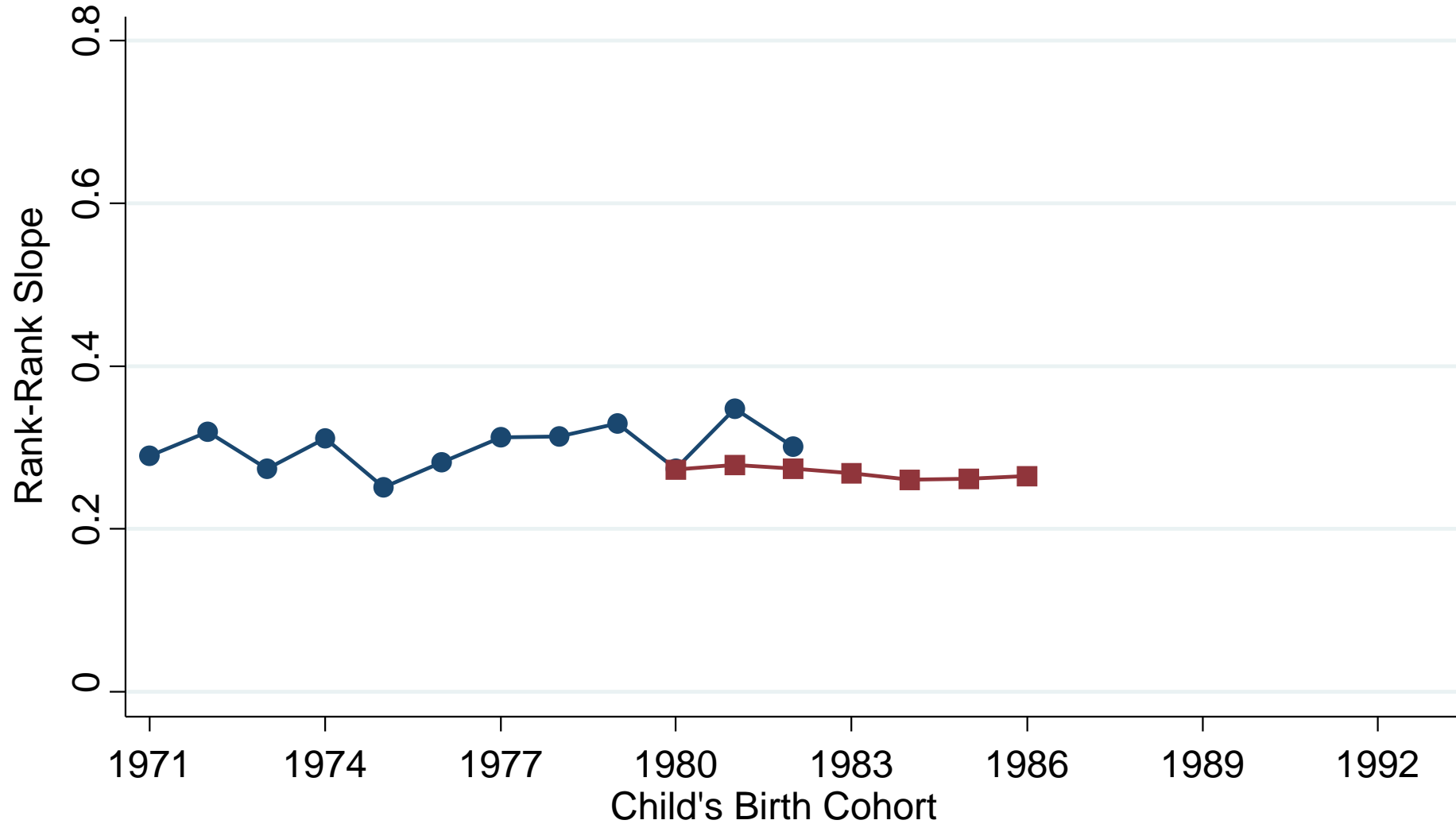
● 1971-74 ▲ 1975-78 □ 1979-82

Intergenerational Mobility Estimates for the 1971-1993 Birth Cohorts



—●— Income Rank-Rank
(Child Age 30)

Intergenerational Mobility Estimates for the 1971-1993 Birth Cohorts

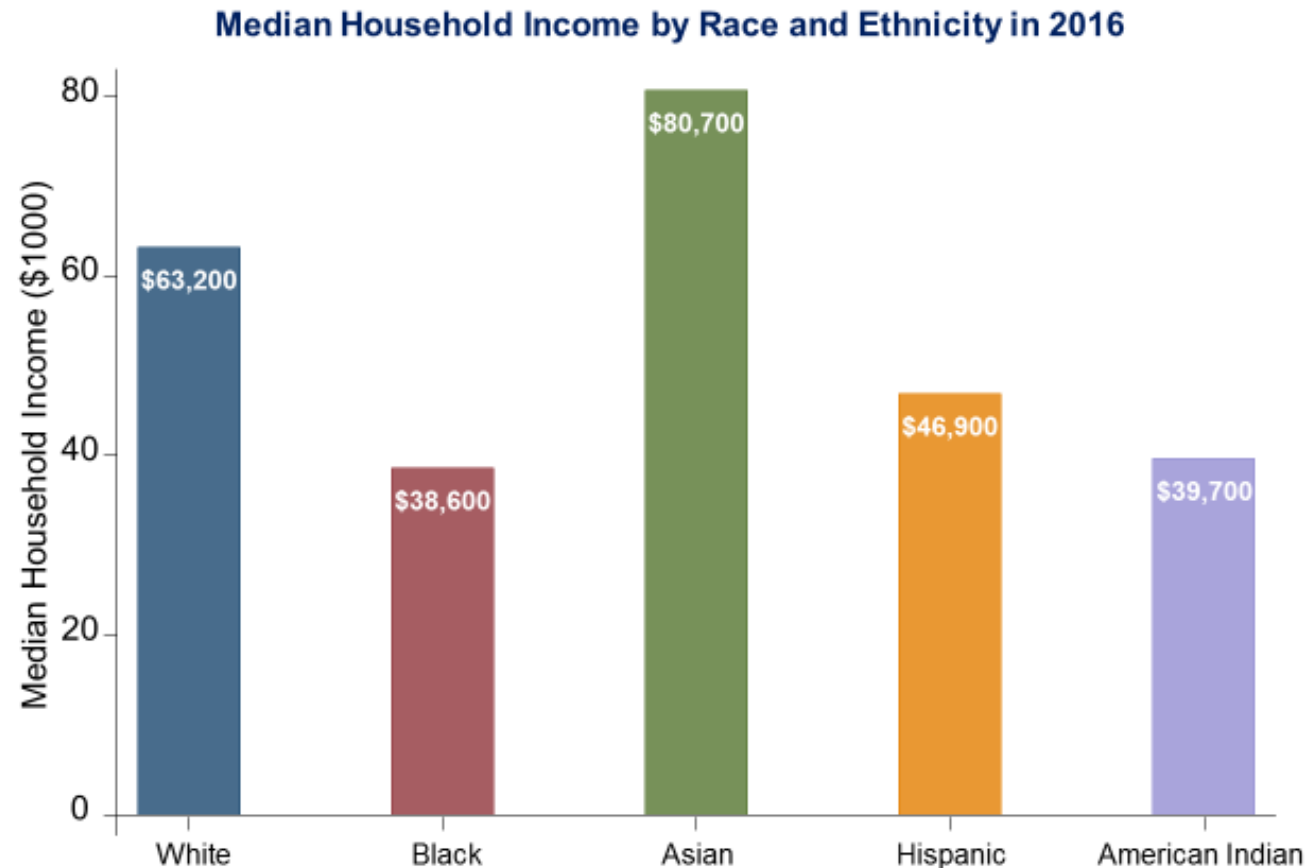


Income Rank-Rank
(Child Age 30; SOI Sample)

Income Rank-Rank
(Child Age 26; Pop. Sample)

What about racial disparities?

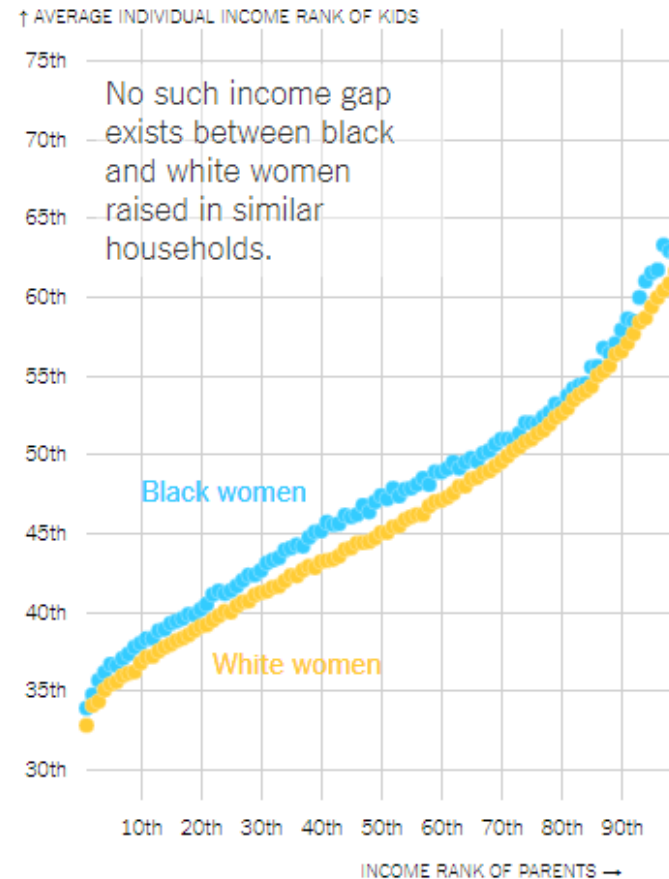
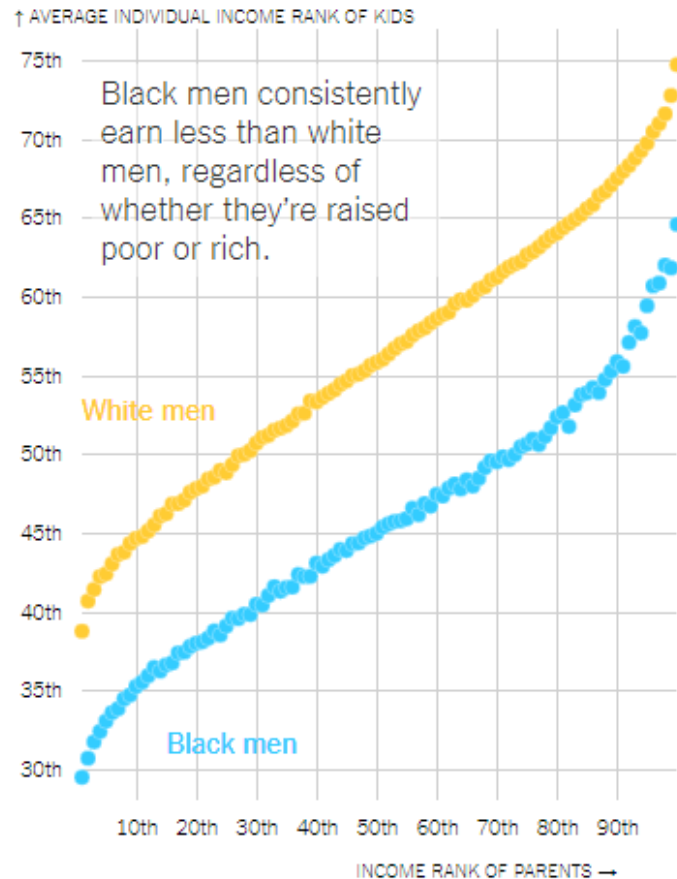
Evidence from US brought by Chetty et al (WP 2018):



Note: We focus here and in subsequent analyses on four non-Hispanic single-race groups (white, black, Asian, American Indian and Alaska Native) and Hispanics. Source: American Community Survey 2016.

What about racial disparities?

Large income gaps persist between men — but not women.

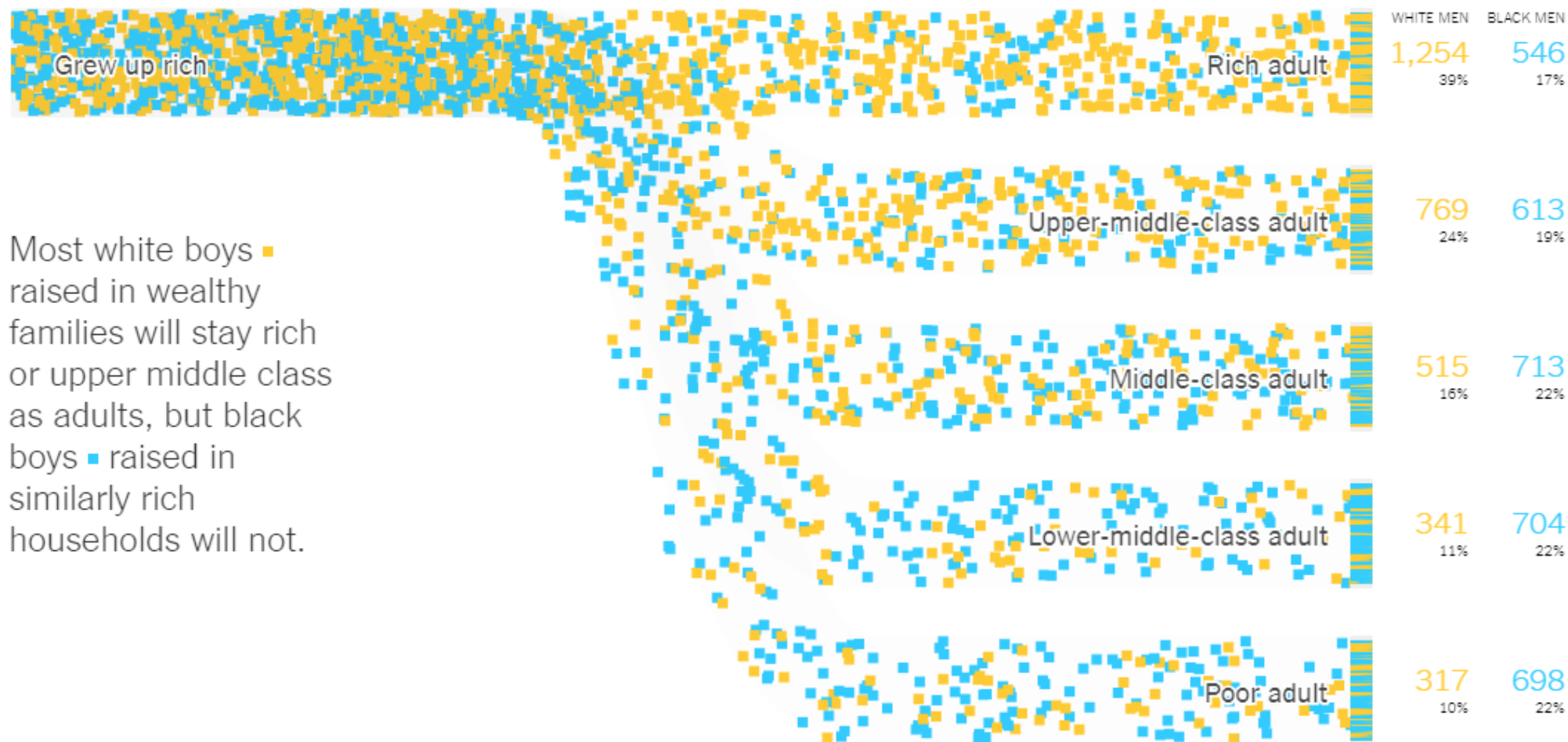


<https://www.nytimes.com/interactive/2018/03/19/upshot/race-class-white-and-black-men.html?smid=fb-share>

What about racial disparities?

Follow the lives of 9,291 boys who grew up in rich families ...

...and see where they end up as adults:



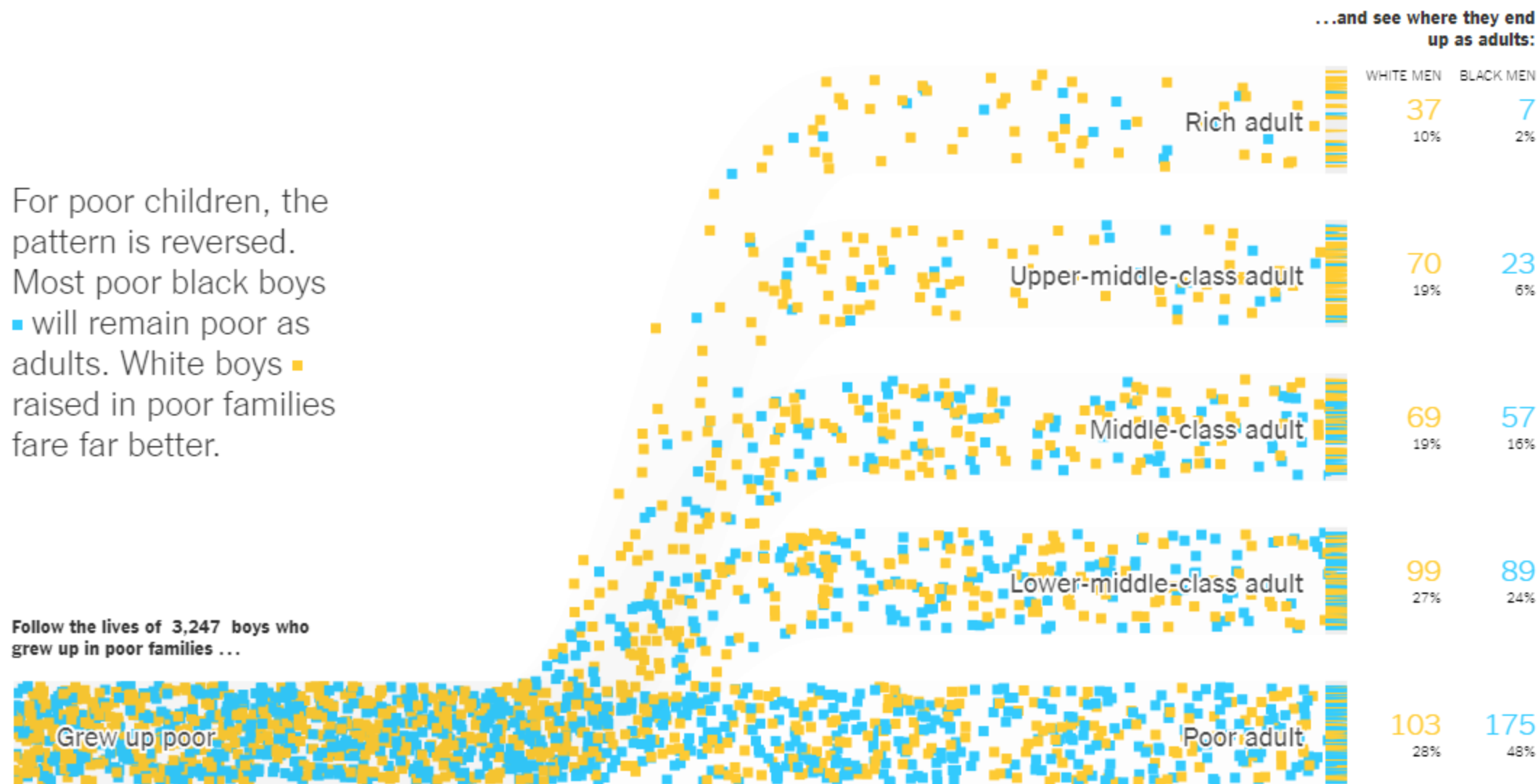
Most white boys raised in wealthy families will stay rich or upper middle class as adults, but black boys raised in similarly rich households will not.

Adult outcomes reflect household incomes in 2014 and 2015.

What about racial disparities?

For poor children, the pattern is reversed. Most poor black boys ■ will remain poor as adults. White boys ■ raised in poor families fare far better.

Follow the lives of 3,247 boys who grew up in poor families ...



Welfare Inequality & Education Inequality

- How welfare inequality relates to education inequality?
 - Intergenerational aspects: Differences in educational choices among different social groups
 - Children from a rich family are much more likely to go to college than children from a poor family – Chetty et al (2017)
 - But: How education attainment translates into economic opportunities?
 - It is nice to look at data across social economic/racial groups on welfare outcomes and education
 - Macro and micro data connecting school progress and education disparities among social/racial group
- **Let's look to data on racial disparities from Brazil to tackle this issue**

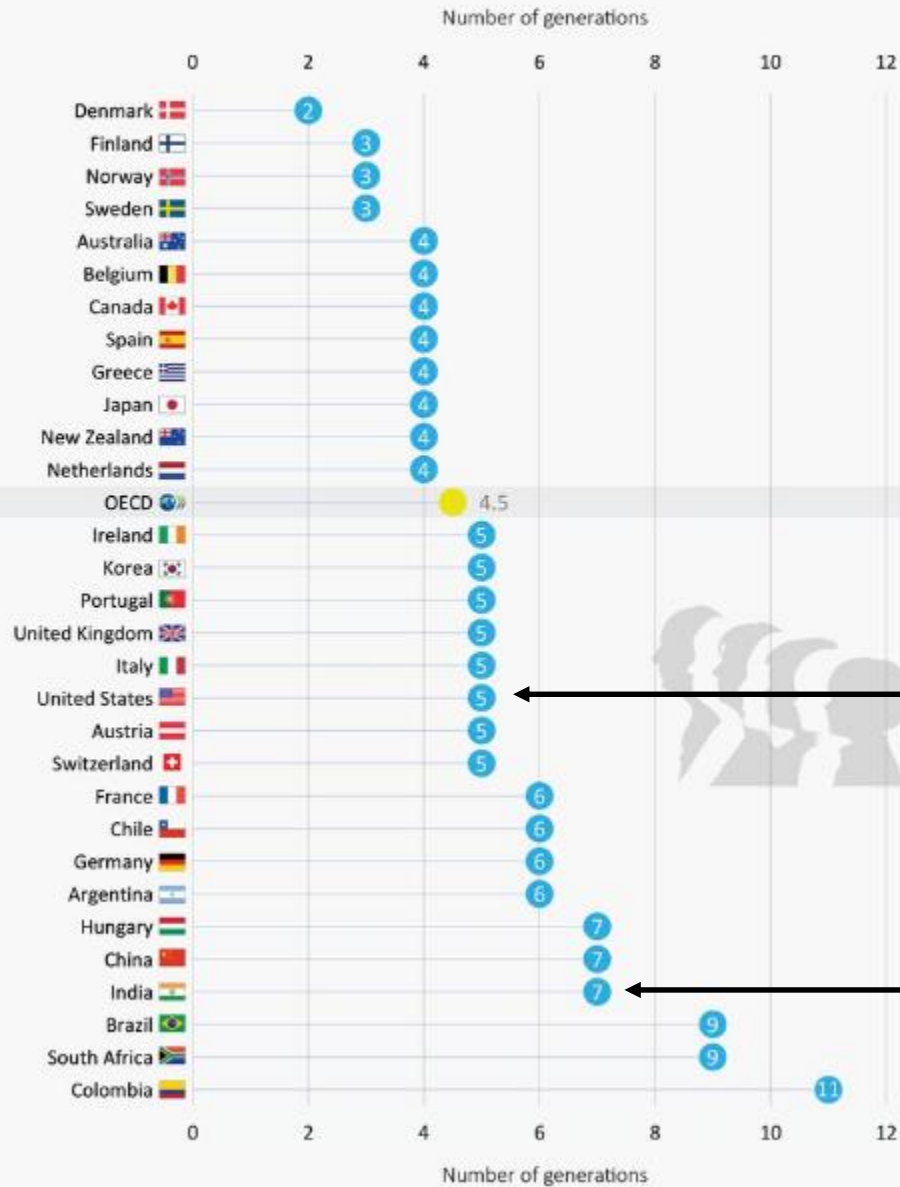
Brazilian Social and Racial Background

- Social Landscape
 - Inequality in Brazil is extremely high. Brazil ranks 148 in a gini index rank with 158 countries (World Bank)
 - Social and economic mobility in Brazil is very low (Brazil ranks 27 out of 29).
- Racial Landscape
 - Large rates of miscegenation have led most observers to conclude that in the absence of racial conflict, Brazil had simply avoided consequences of enslavement over socioeconomic outcomes and mobility.
 - There is overwhelming evidence of pertinent differences between Whites and non-Whites in terms of wages and other measures of living standards.
- We reproduce some of these stylized facts



Income mobility across generations

Number of generations it would take for those born in low-income families to approach the mean income in their society



US ranks 17/29

Brazil ranks 27/29

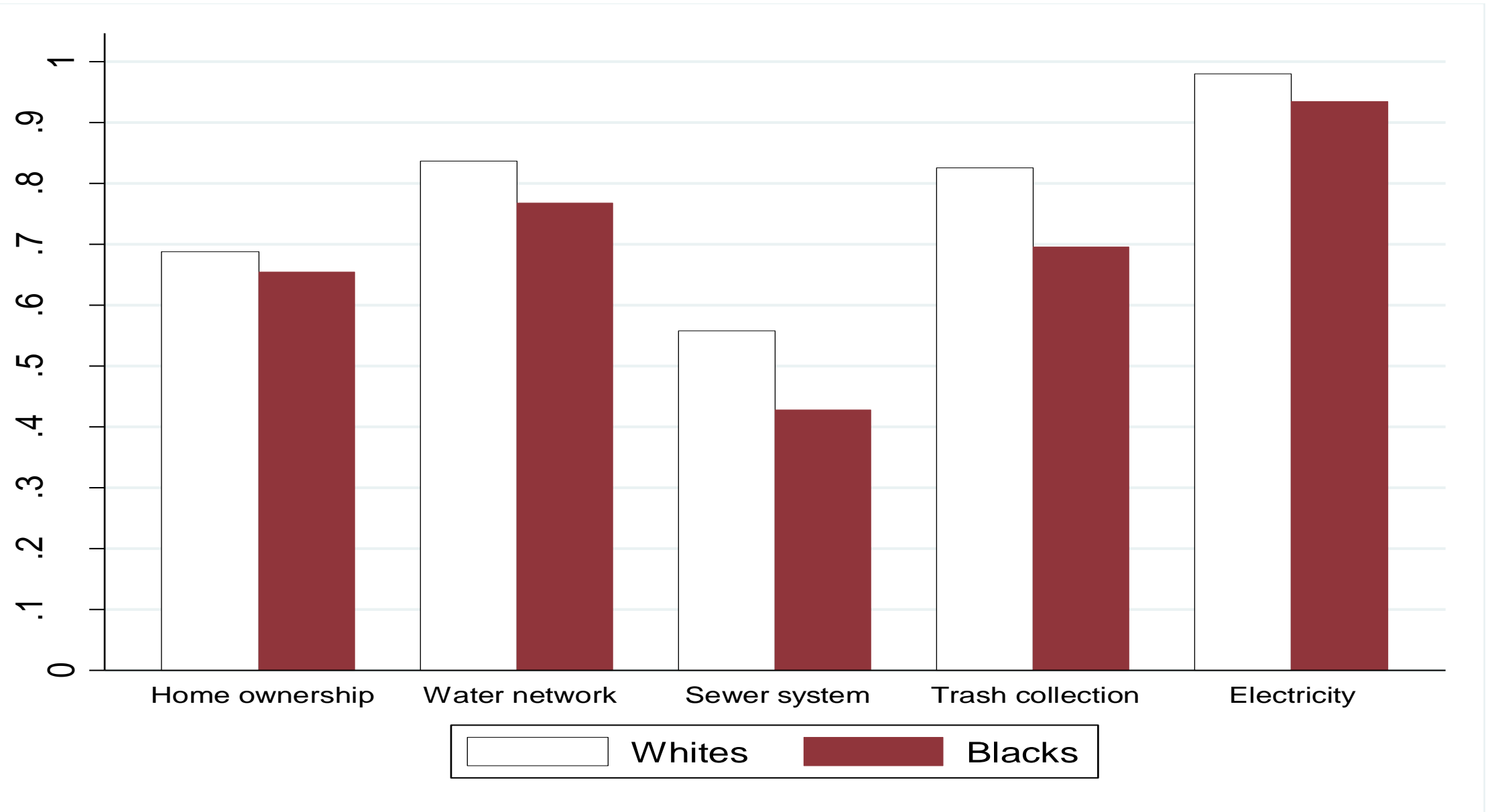


Figure 1: Living standards by race, Brazil 2000

Data source: Population Census 2000, IBGE.

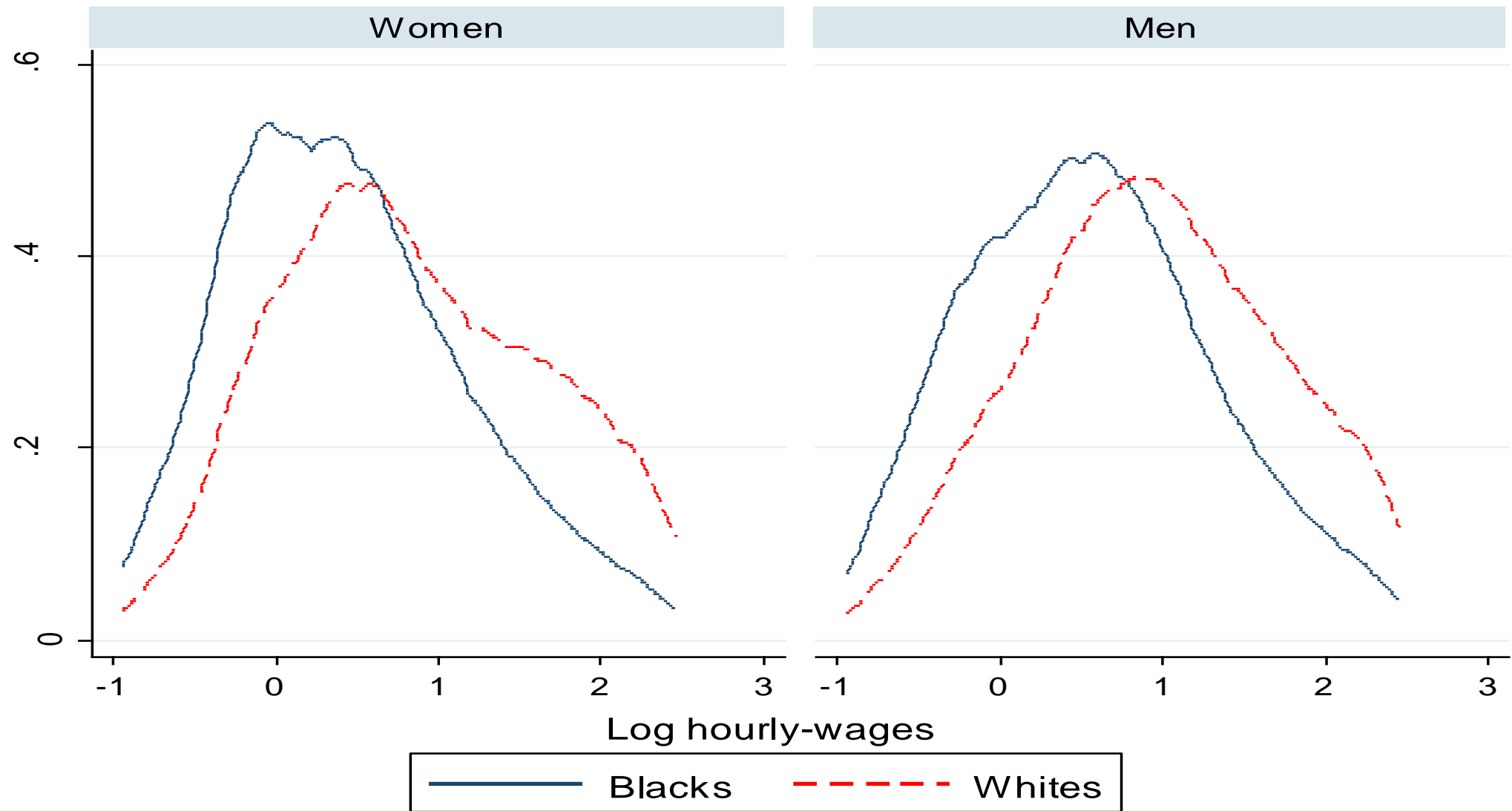


Figure 2: Hourly wages by race (in logarithms), Brazil 2000

Data source: Population Census 2000, IBGE.

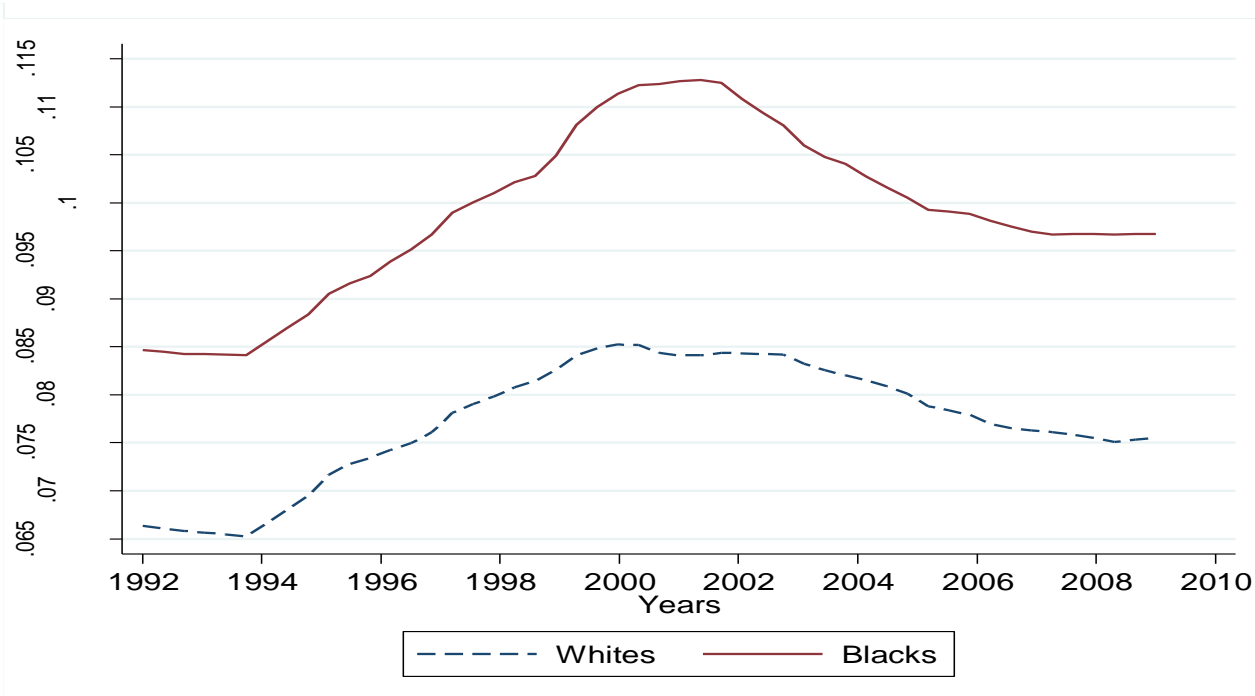
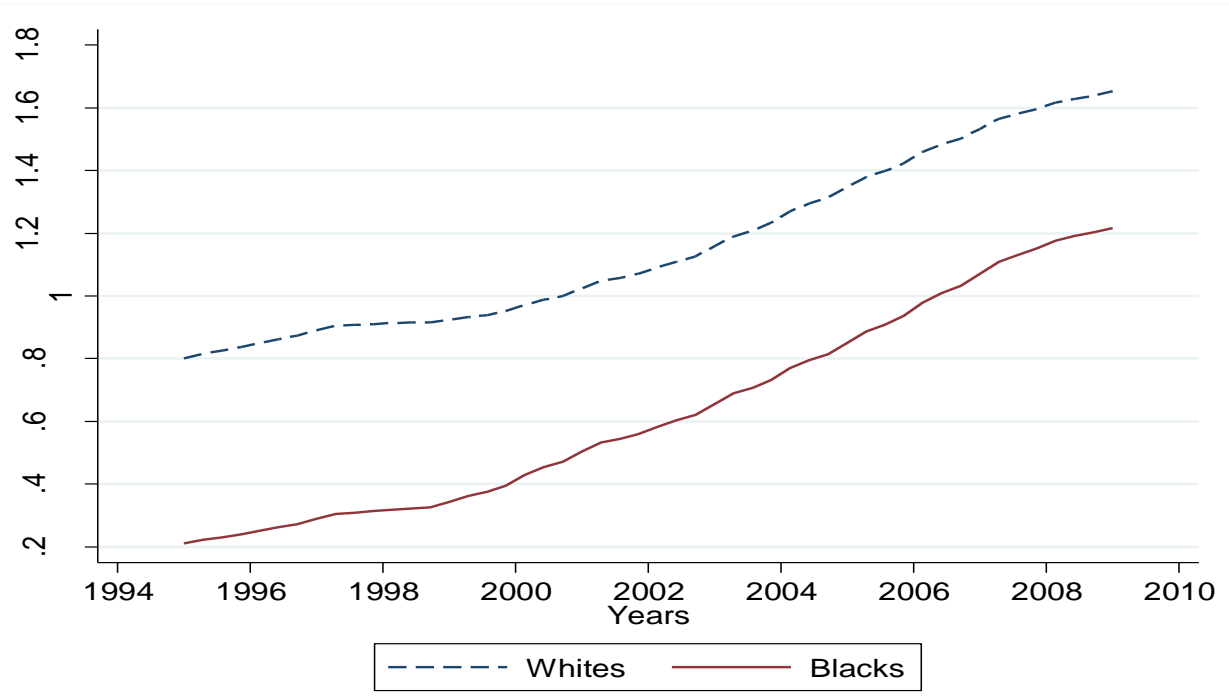


Figure 3: Hourly wages and non-employment rates by race (in logarithms), Brazil 1992-2009

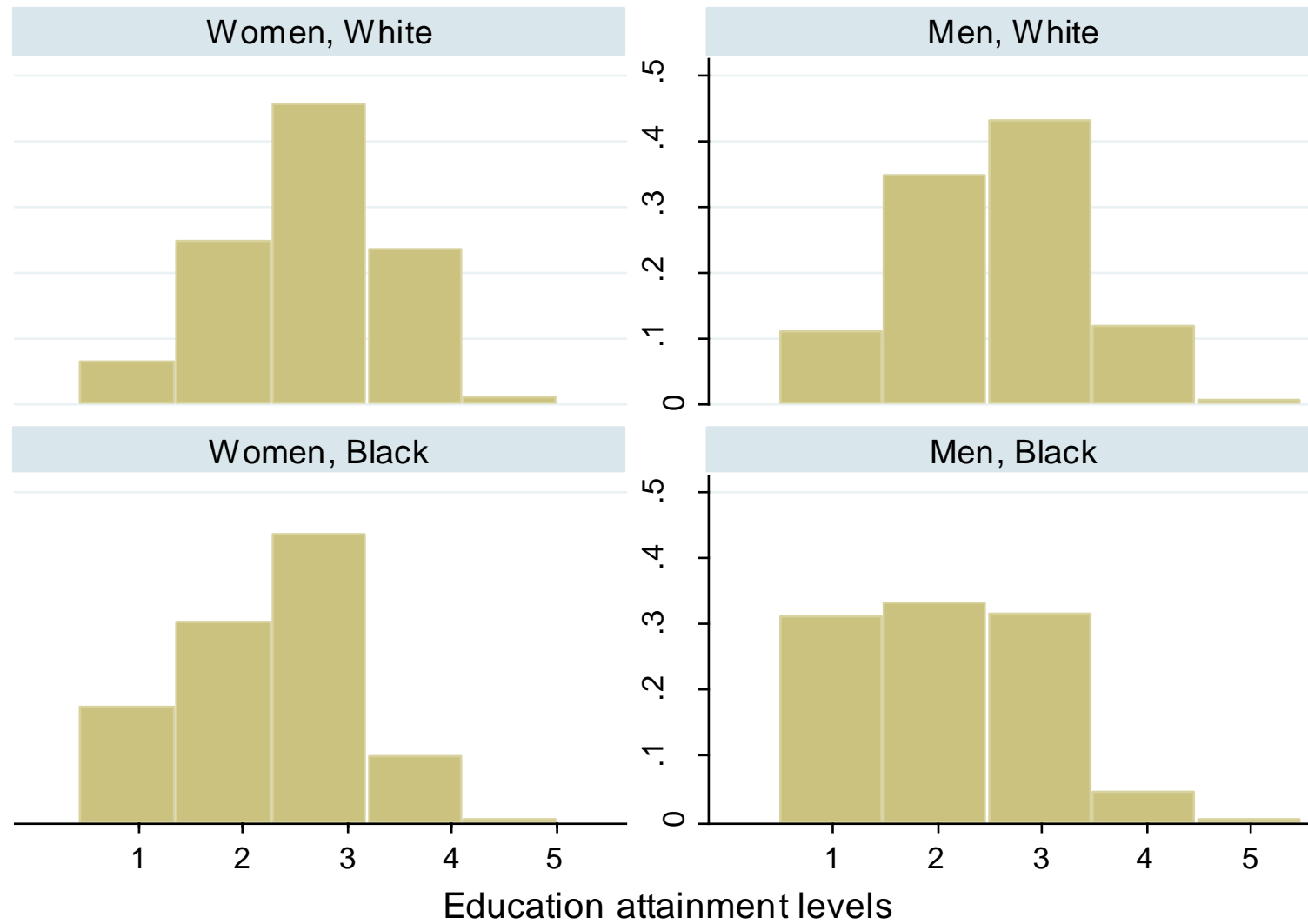
Data source: PNAD, IBGE.

Stylized Facts : Living Standards and Labor Market

- Blacks are consistently found in worse conditions when compared with Whites on all dimensions of living standards investigated.
- The wage distribution is shifted to the right for Whites.
- Hourly wages are approximately 40% higher for Whites.
- The gap in income-generating capabilities is remarkably constant in the fifteen-year period between 1995 and 2009
 - Racial differences are slightly reduced in terms of wages
 - There is no sign of relative improvement in the unemployment indicator among Blacks

Stylized Facts : Living Standards and Labor Market

- Two main factors that could explain racial differentials in those economic outcomes:
 1. Discrimination or prejudice against blacks in the labor market
 2. The result of lower investment in the accumulation of skills by darker-skin individuals, which translates into a scarcity of economic opportunities
 - Pre-market factors (Neal and Johnson, 1995)



1. Less than primary; 2. Primary (8 years); 3. High-School (11 years); 4. College; 5. Graduate studies

Figure 4: Education attainment by race (completed degrees), Brazil 2000

Data source: Population Census 2000, IBGE.

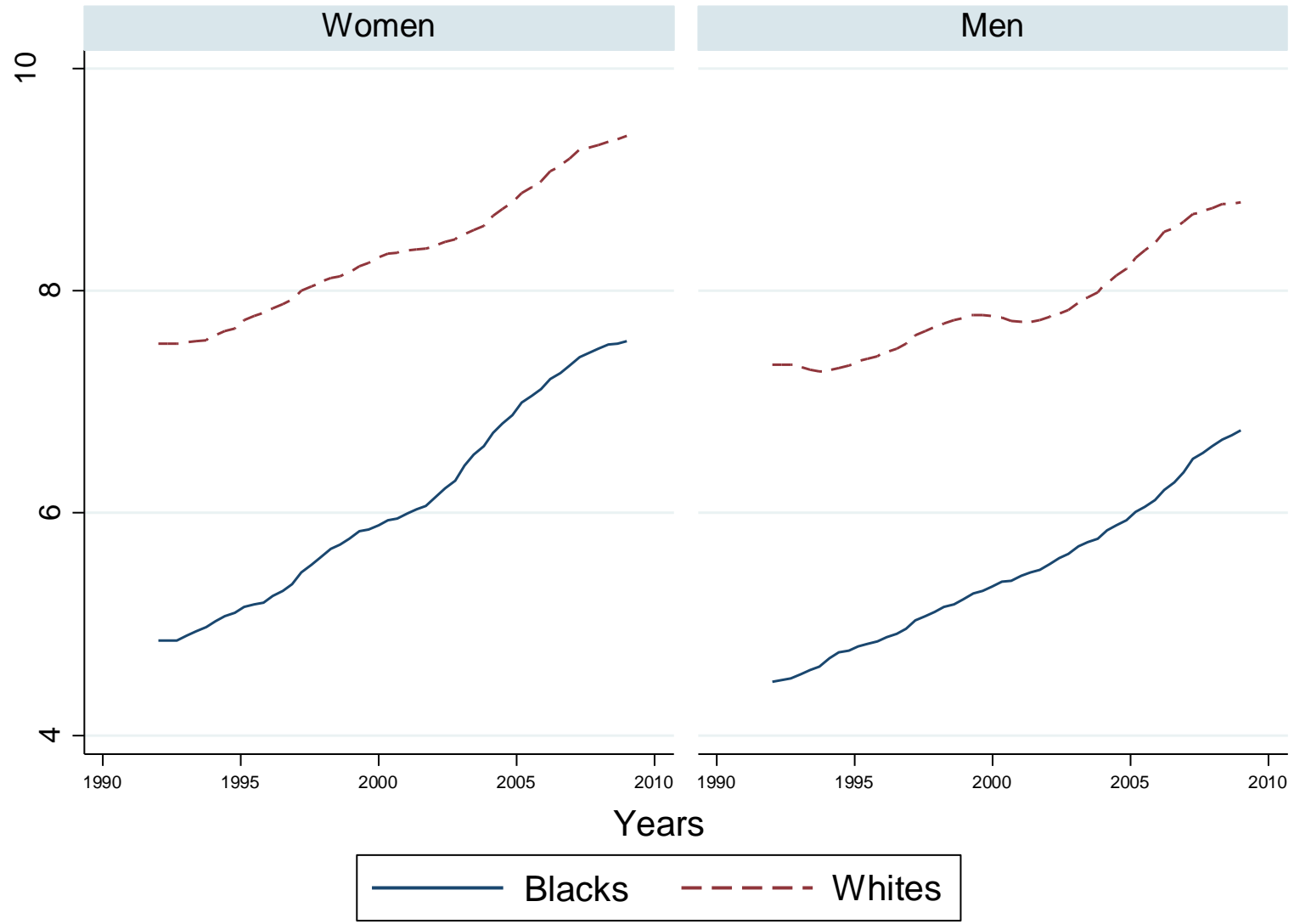


Figure 5: Education attainment by race over time (completed years) for adults age 35, Brazil 1992-2009

Data source: Brazilian Household Survey (PNAD), IBGE.

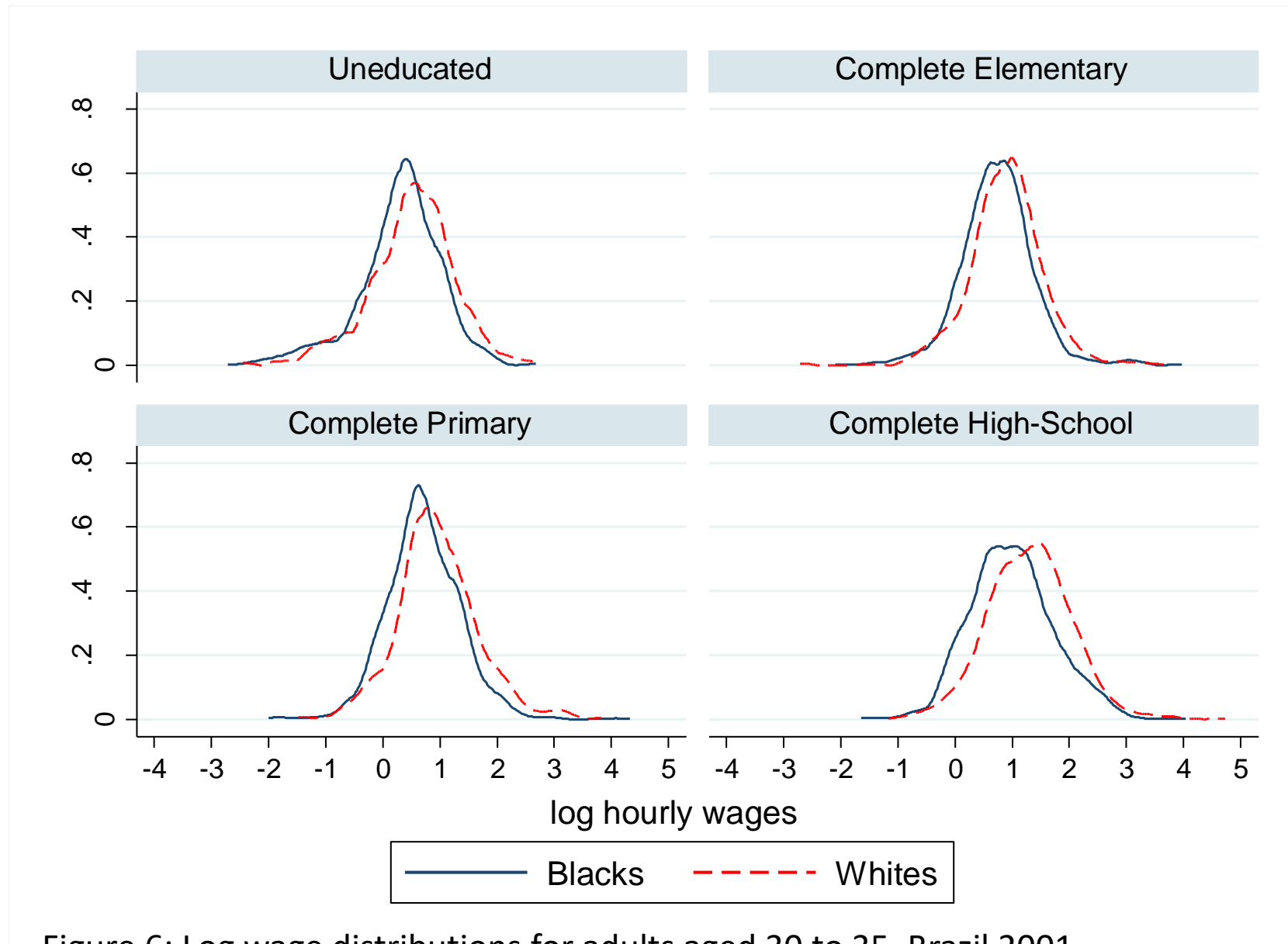


Figure 6: Log wage distributions for adults aged 30 to 35, Brazil 2001

Data source: Brazilian Household Survey (PNAD), IBGE.

Stylized Facts : Educational Attainment

- Blacks consistently accumulate less human capital in the form of formal education (lower quantity)
- Our findings indicate that accounting for educational disparities accounts for roughly 50% of the differences between Blacks and Whites.
 - Differences in unemployment rates are reduced from 2 to 1 percentage point
 - Differences in hourly wages go from .53 to .24 log-points.
 - Differences are particularly sizable for the population with more education

Trends in Attainment Gaps: Aggregate Data

- The 1990s marked a decade of structural changes in Brazil
 - Inflation stability was reached in 1995
 - planning and investment in education of children became more attractive to poorer parents
 - There was a significant regulatory wave in education policy
 - Initial steps were taken in the establishment of a system accountability based on national examination of students
 - Federal government launched the Bolsa Escola Program (CCT)
 - Major funding reform affected amounts and regional distribution of resources for school construction, maintenance and improvement
- These systemic changes led to a dramatic increase in the rates of enrollment of school-aged children.
 - This “*democratization*” process has had a major impact on the representation of a deprived portion of the population within classrooms. In particular the black population.

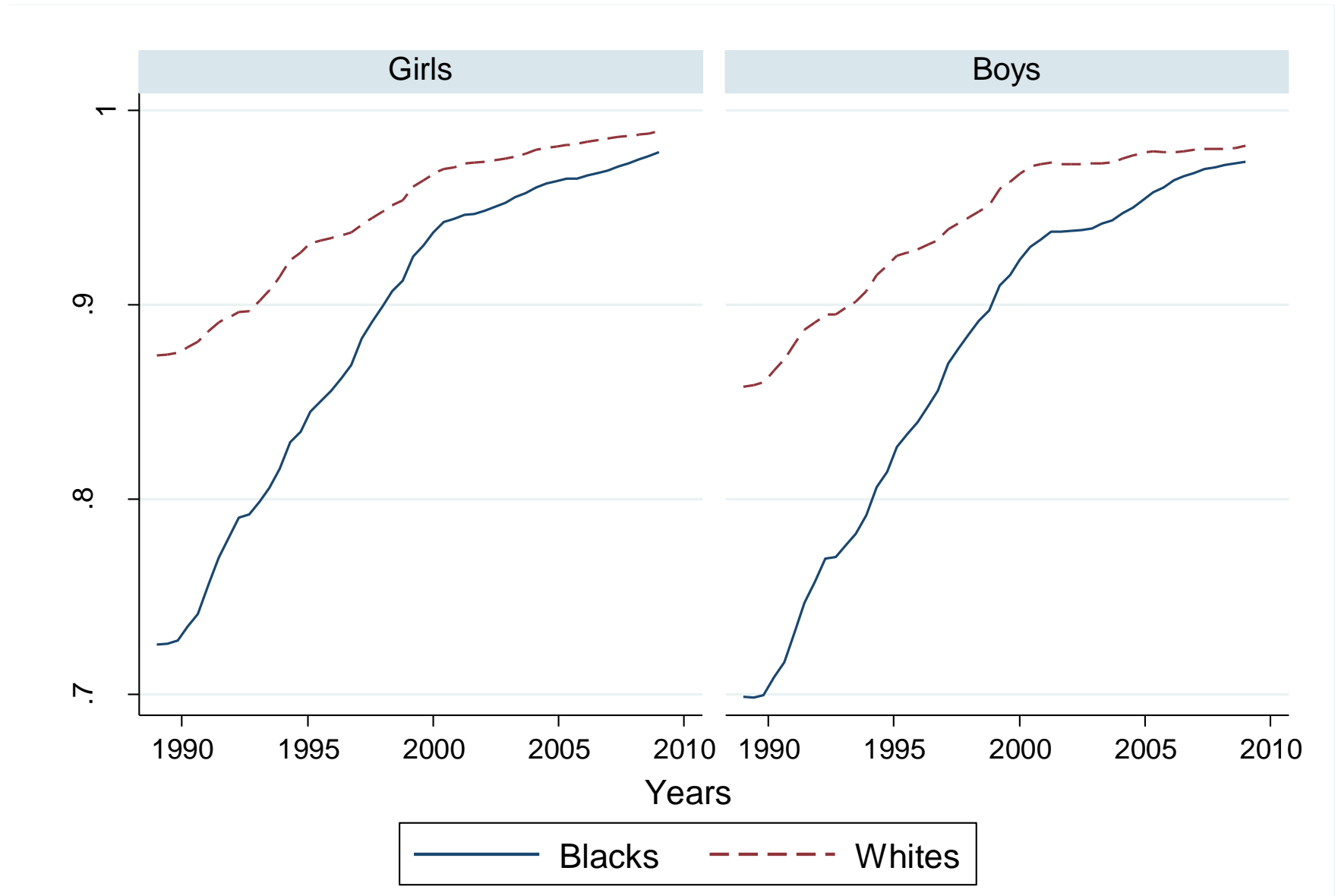


Figure 7: Enrollment rates for children aged 7, Brazil – 1989-2009

Data source: Brazilian Household Survey (PNAD), IBGE.

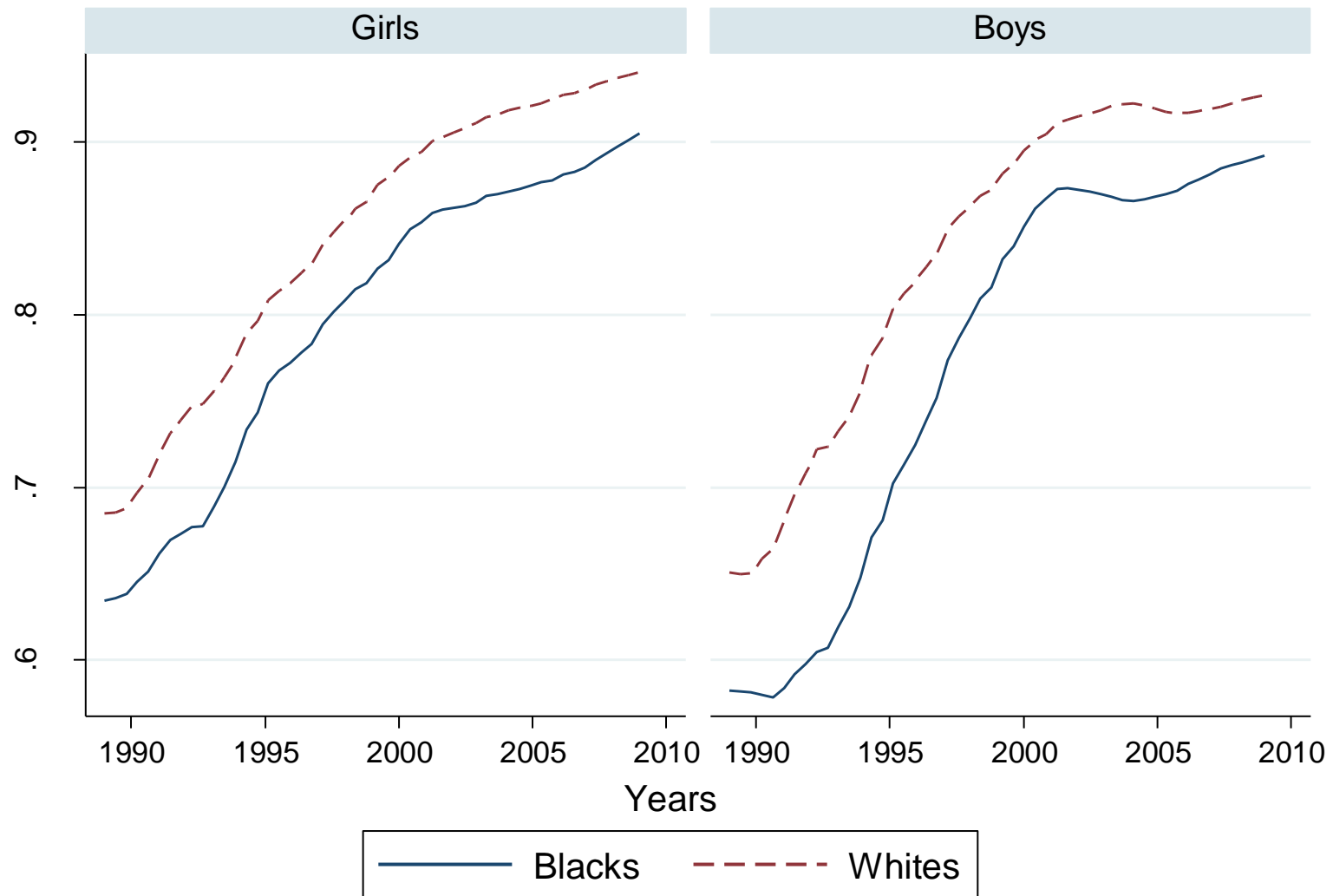


Figure 8: Enrollment rates for children aged 15, Brazil – 1989-2009

Data source: Brazilian Household Survey (PNAD), IBGE.

Trends in Attainment Gaps: Longitudinal Micro Data

- Open question: the quality of education received by each group can be considered comparable?
- Employing administrative data from São Paulo state, we investigate the racial gap in two main dimensions:
 - I. student progression in the school system;
 - II. student performance on standardized tests.

Table 1: Attrition Rates for White Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	345,838					345.838
	100,00%					100,00%
2008	13,763	323,050				336.813
	3,98%	93,41%				97,39%
2009	1,924	25,650	306,152			333.726
	0,56%	7,42%	88,52%			96,50%
2010	400	5,044	26,820	298,699		330.963
	0,12%	1,46%	7,76%	86,37%		95,70%
2011	131	1,245	6,012	33,506	281,517	322.411
	0,04%	0,36%	1,74%	9,69%	81,40%	93,23%

Table 2: Attrition Rates for Black Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	186,135					186.135
	100,00%					100,00%
2008	9,977	169,970				179.947
	5,36%	91,32%				96,68%
2009	1,664	19,184	157,237			178.085
	0,89%	10,31%	84,47%			95,68%
2010	356	4,530	19,292	152,112		176.290
	0,19%	2,43%	10,36%	81,72%		94,71%
2011	117	1,136	5,252	24,896	139,044	170.445
	0,06%	0,61%	2,82%	13,38%	74,70%	91,57%

Table 1: Attrition Rates for White Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	345,838					345.838
	100,00%					100,00%
2008	13,763	323,050				336.813
	3,98%	93,41%				97,39%
2009	1,924	25,650	306,152			333.726
	0,56%	7,42%	88,52%			96,50%
2010	400	5,044	26,820	298,699		330.963
	0,12%	1,46%	7,76%	86,37%		95,70%
2011	131	1,245	6,012	33,506	281,517	322.411
	0,04%	0,36%	1,74%	9,69%	81,40%	93,23%

Table 2: Attrition Rates for Black Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	186,135					186.135
	100,00%					100,00%
2008	9,977	169,970				179.947
	5,36%	91,32%				96,68%
2009	1,664	19,184	157,237			178.085
	0,89%	10,31%	84,47%			95,68%
2010	356	4,530	19,292	152,112		176.290
	0,19%	2,43%	10,36%	81,72%		94,71%
2011	117	1,136	5,252	24,896	139,044	170.445
	0,06%	0,61%	2,82%	13,38%	74,70%	91,57%

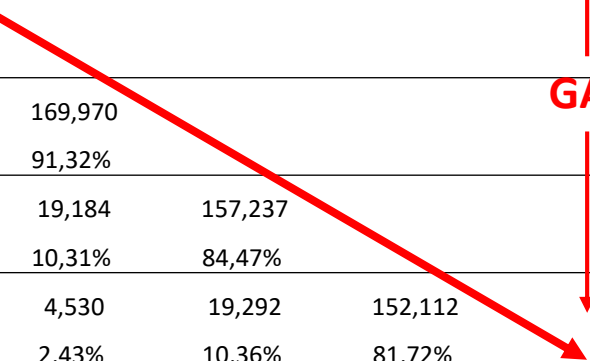
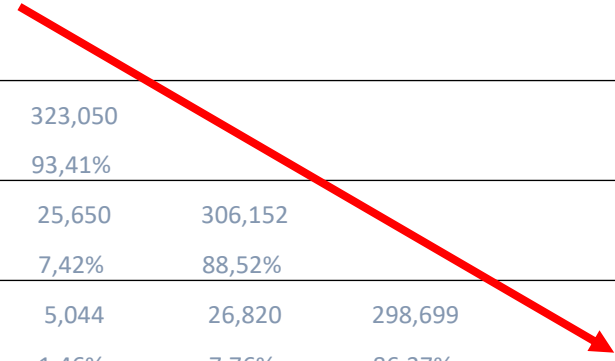
Table 1: Attrition Rates for White Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	345,838					345.838
	100,00%					100,00%
2008	13,763	323,050				336.813
	3,98%	93,41%				97,39%
2009	1,924	25,650	306,152			333.726
	0,56%	7,42%	88,52%			96,50%
2010	400	5,044	26,820	298,699		330.963
	0,12%	1,46%	7,76%	86,37%		95,70%
2011	131	1,245	6,012	33,506	281,517	322.411
	0,04%	0,36%	1,74%	9,69%	81,40%	93,23%

Table 2: Attrition Rates for Black Students, all types of schools

	2nd Grade	3rd Grade	4rd Grade	5th Grade	6th Grade	Total
2007	186,135					186.135
	100,00%					100,00%
2008	9,977	169,970				179.947
	5,36%	91,32%				96,68%
2009	1,664	19,184	157,237			178.085
	0,89%	10,31%	84,47%			95,68%
2010	356	4,530	19,292	152,112		176.290
	0,19%	2,43%	10,36%	81,72%		94,71%
2011	117	1,136	5,252	24,896	139,044	170.445
	0,06%	0,61%	2,82%	13,38%	74,70%	91,57%

GAP



281,517
81,40%

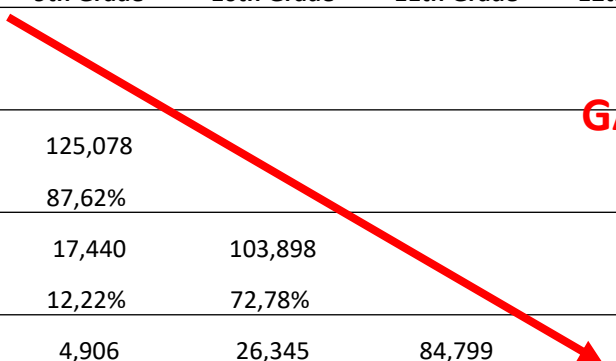
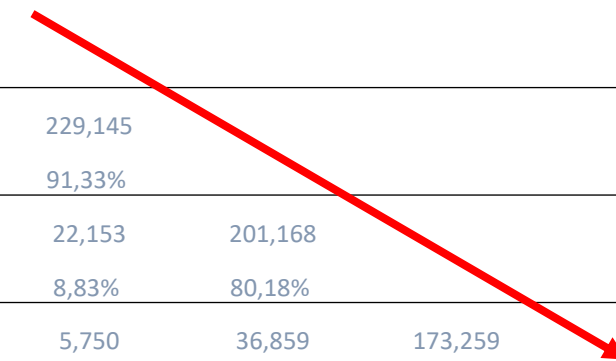
139,044
74,70%

Table 3: Attrition Rates for White Students, all types of schools

	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade	Total
2007	250,896					250.896
	100,00%					100,00%
2008	11,176	229,145				240.321
	4,45%	91,33%				95,79%
2009	2,329	22,153	201,168			225.650
	0,93%	8,83%	80,18%			89,94%
2010	576	5,750	36,859	173,259		216.444
	0,23%	2,29%	14,69%	69,06%		86,27%
2011	60	893	10,648	27,231	156,705	195.537
	0,02%	0,36%	4,24%	10,85%	62,46%	77,94%

Table 4: Attrition Rates for Black Students, all types of schools

	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade	Total
2007	142,758					142.758
	100,00%					100,00%
2008	9,219	125,078				134.297
	6,46%	87,62%				94,07%
2009	2,076	17,440	103,898			123.414
	1,45%	12,22%	72,78%			86,45%
2010	538	4,906	26,345	84,799		116.588
	0,38%	3,44%	18,45%	59,40%		81,67%
2011	67	752	8,355	17,847	73,852	100.873
	0,05%	0,53%	5,85%	12,50%	51,73%	70,66%



156,705
62,46%

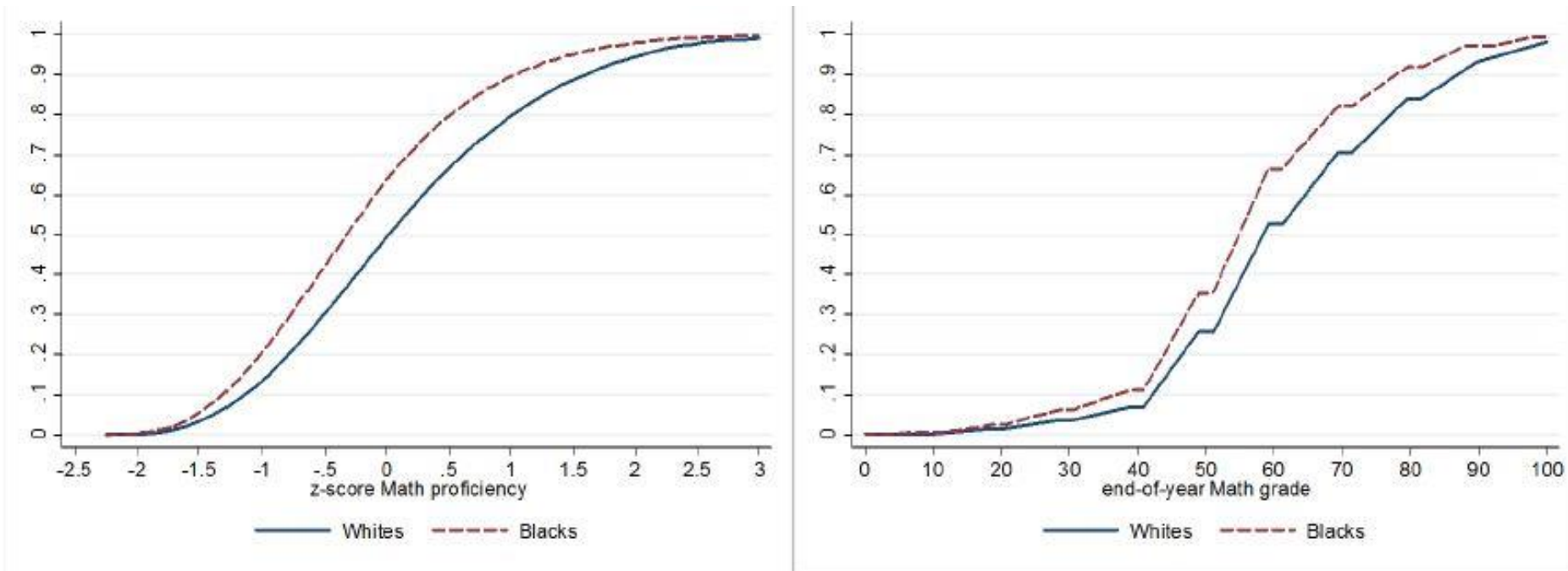
GAP

73,852
51,73%

Trends in Attainment Gaps: Longitudinal Micro Data

- Retention and failure rates are much higher for black students:
 - 81.4% of the White second graders (in 2007) reached the sixth grade in 2011, whereas only 74.7% of the Black do so.
 - 74% of the White students in the eighth grade reach the last year of high school (grade 12), whereas only 51% of the Black do so.
- Do differences in attrition between school levels result from students' own learning experiences?

Figure 3. Cumulative Distribution Functions for Proficiency Scores and Teacher-Assigned Grades for 8th Graders.



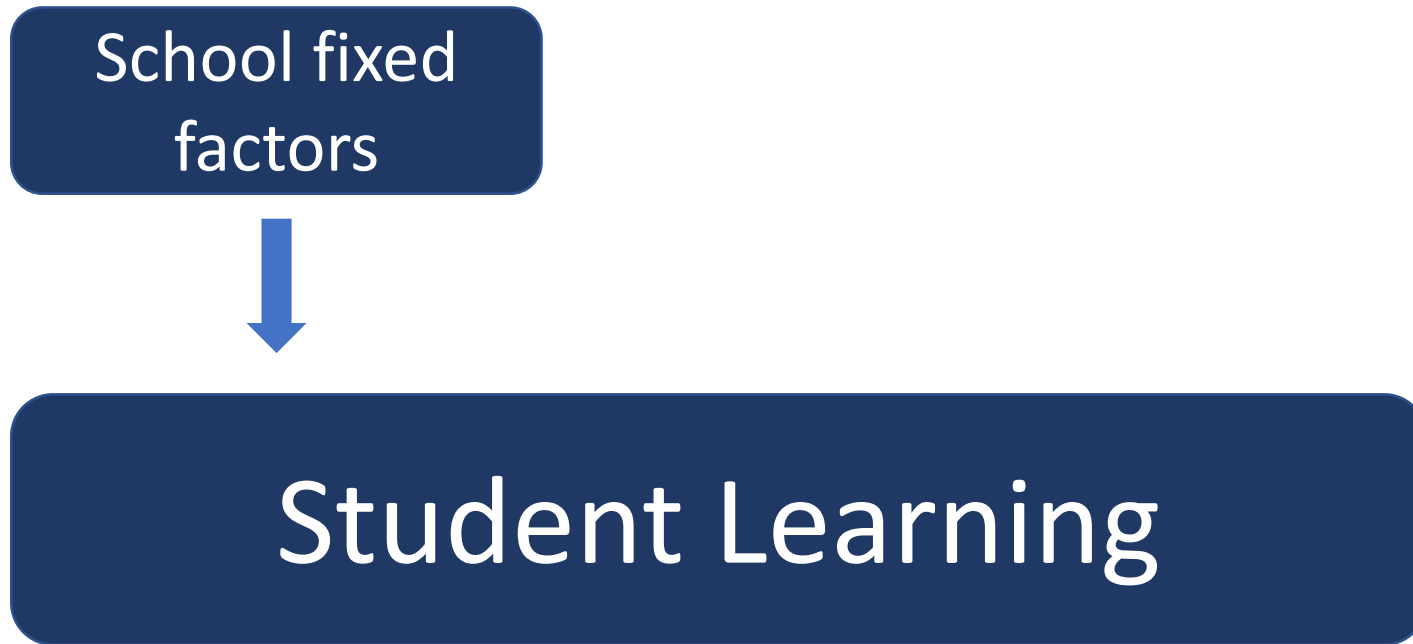
School Production Function

- To investigate what forces might be behind the racial gaps it is important to understand the determinants of learning at school.
 - The production function of learning
- There is a vast theoretical and empirical literature on the determinants of learning
 - The theoretical literature has hypothesized a myriad of factors that might influence learning at school
 - The recent empirical literature has made important advancements in measuring the relevance of some of these different factors

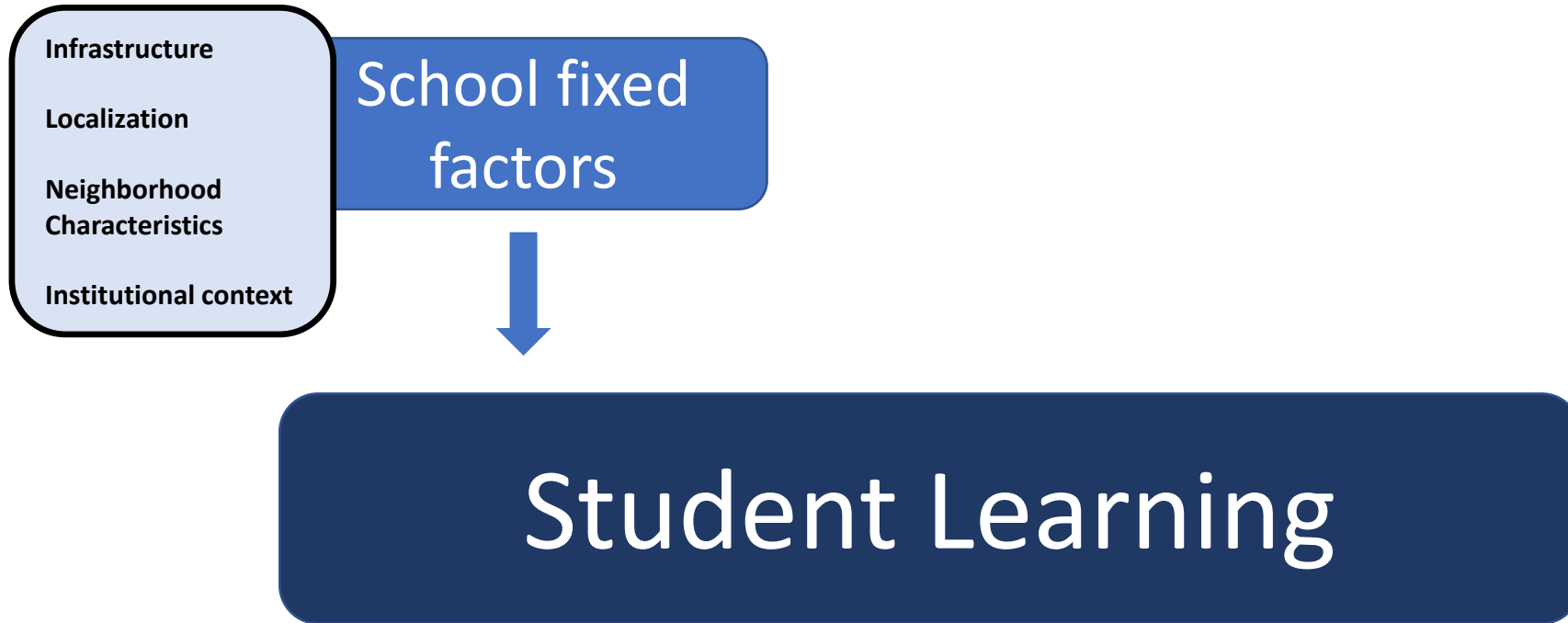
School Production Function

Student Learning

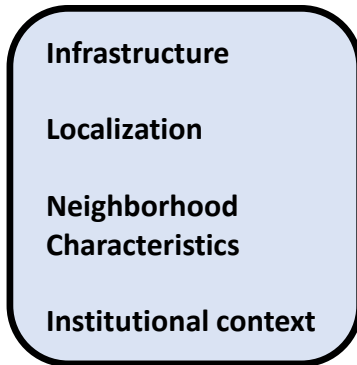
School Production Function



School Production Function



School Production Function



School fixed factors



Student Learning

Potential sources of education inequality

School Access :

Duflo (AER 2001)

Neighborhood:

Chetty et al (AER 2016)

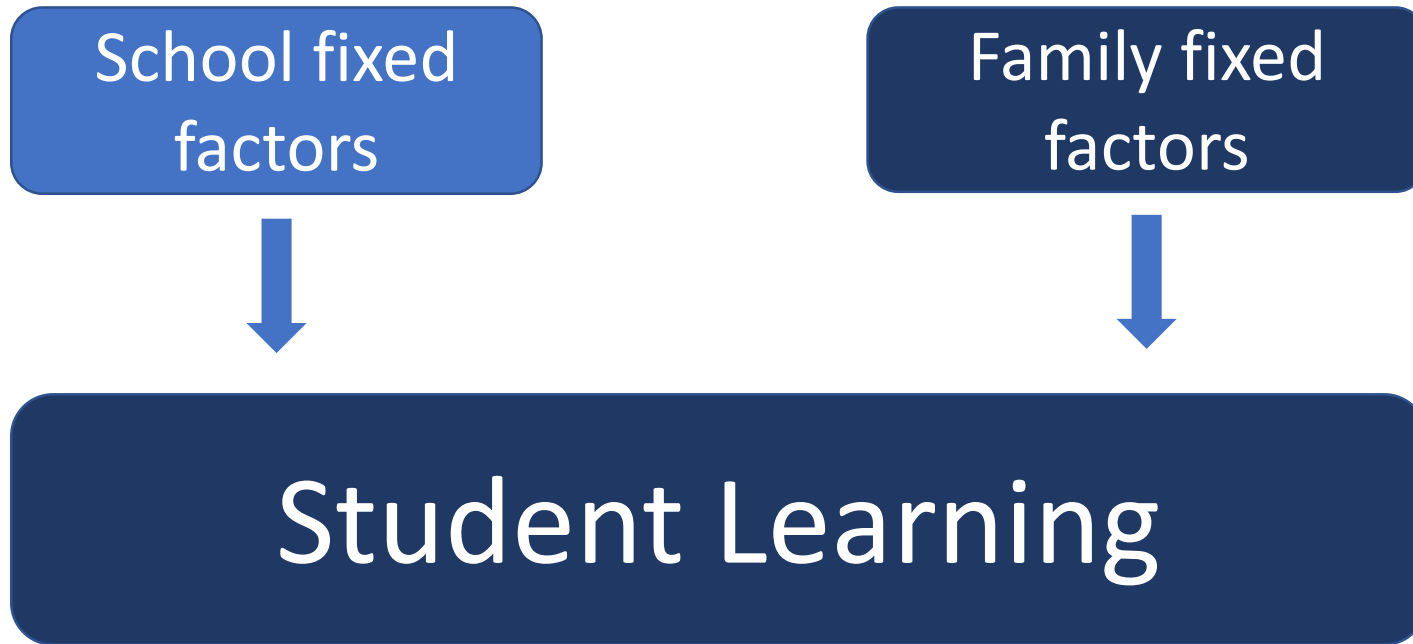
Decentralization:

Galiani et al (JPubE 2008)

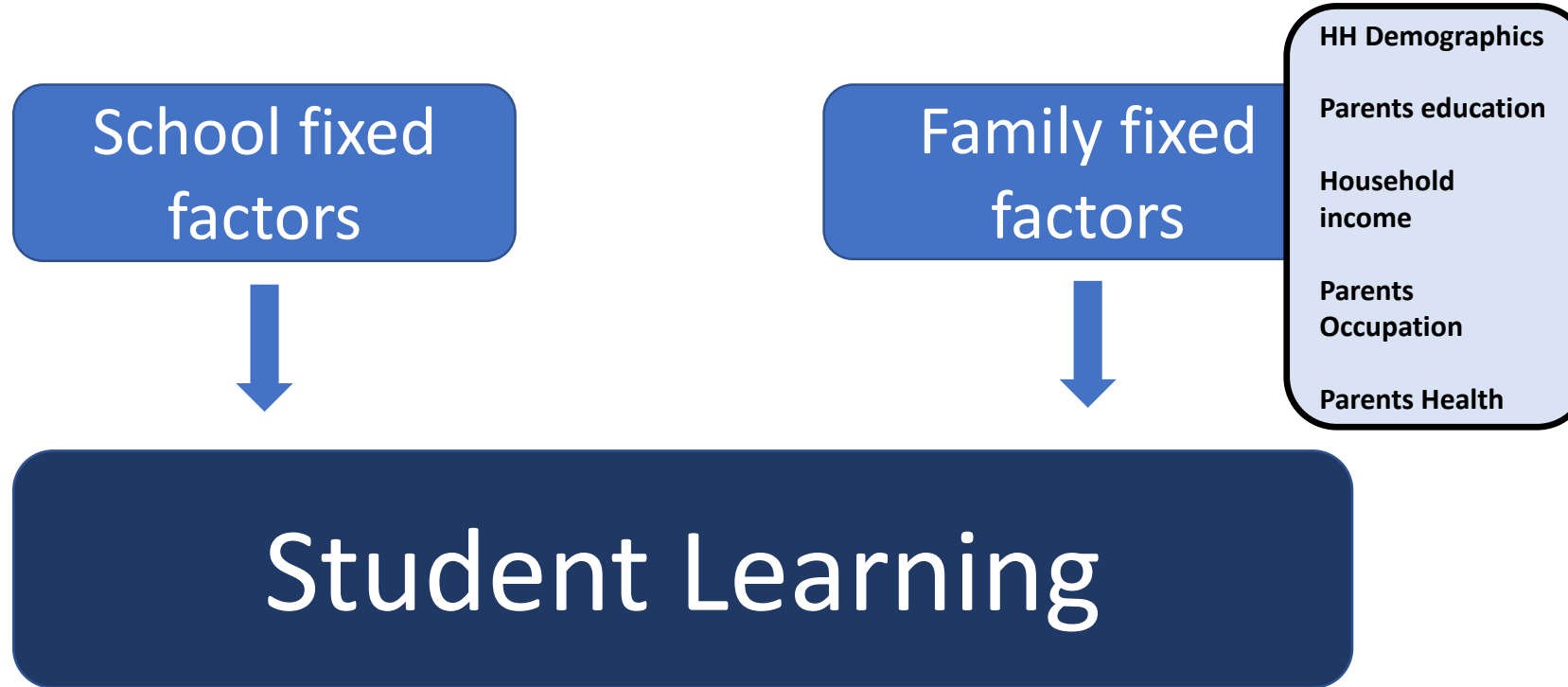
Merit pay:

Muralidharan and Sundararaman (JPE 2011)

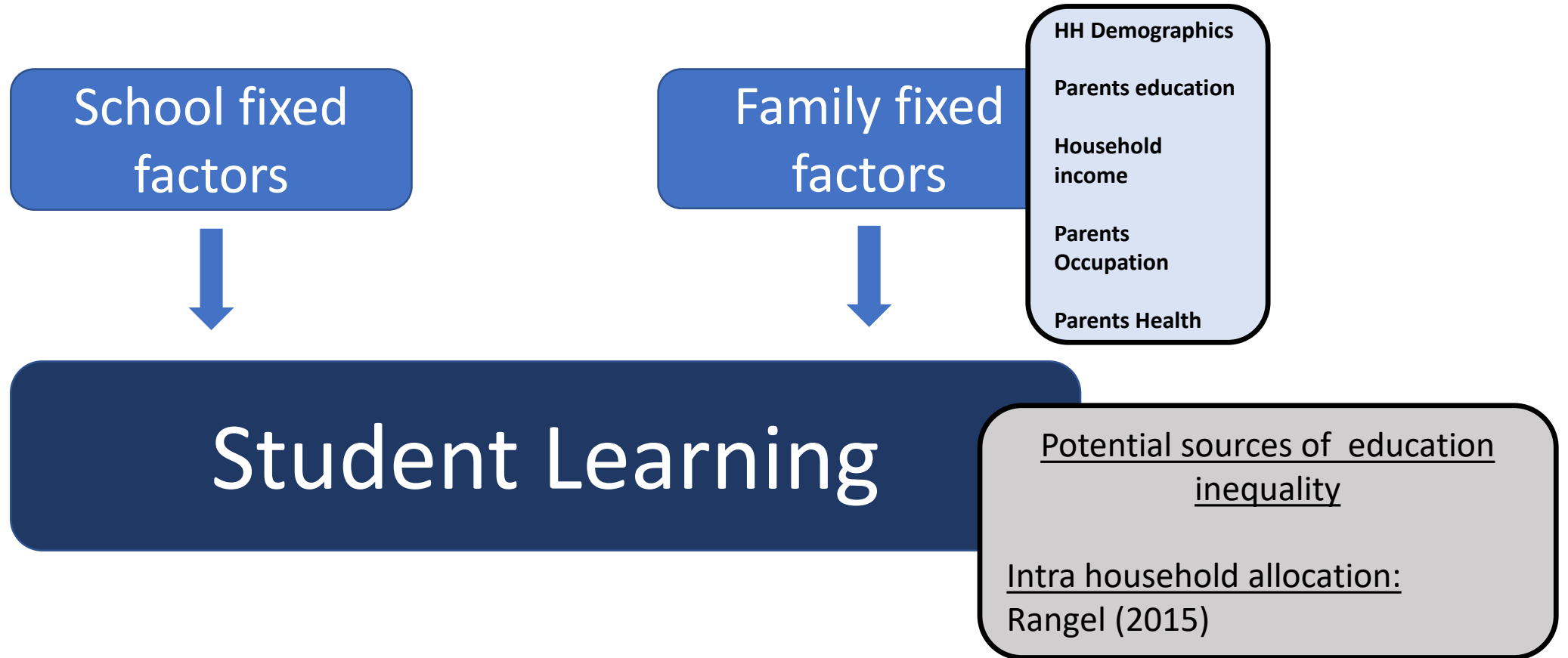
School Production Function



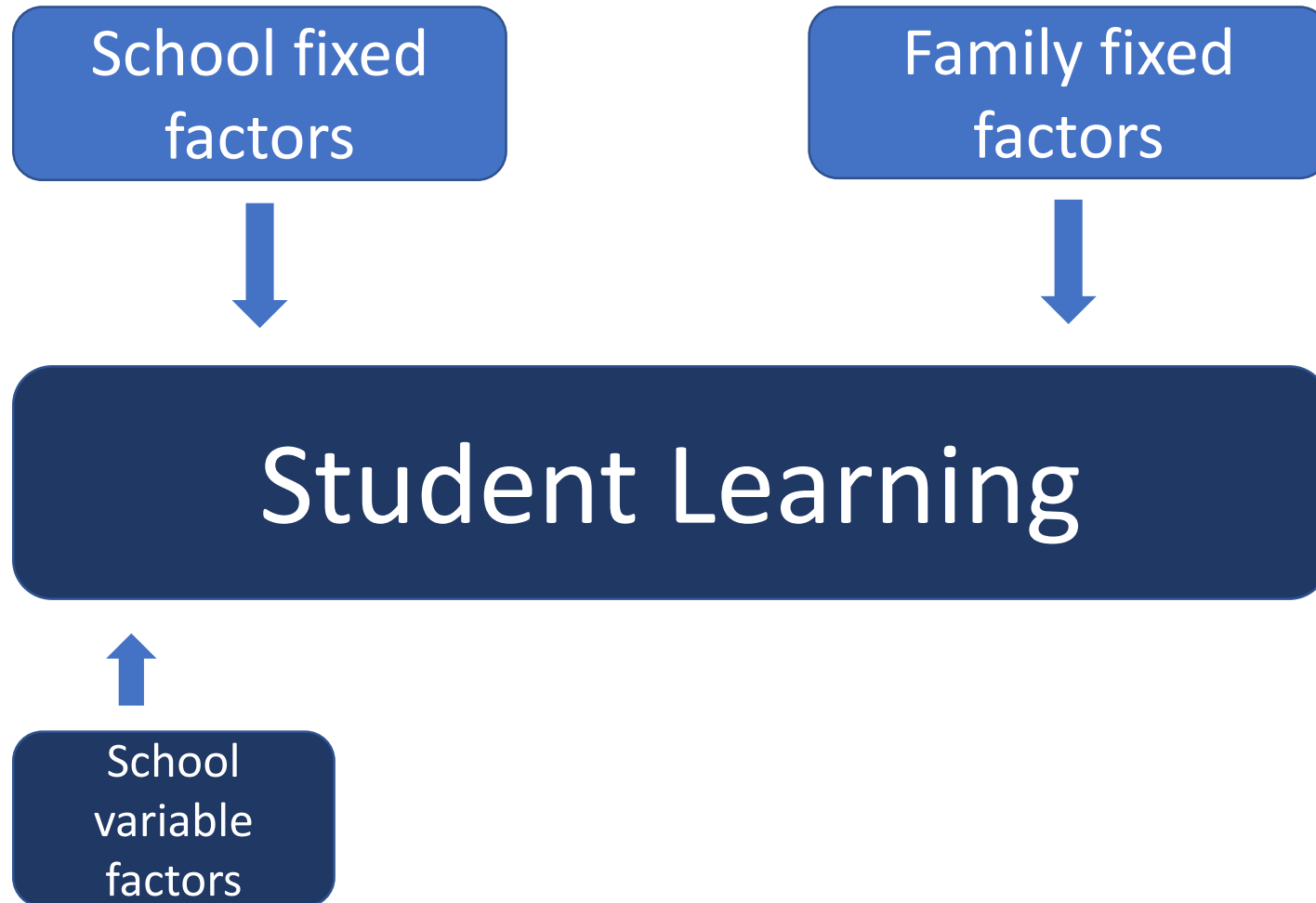
School Production Function



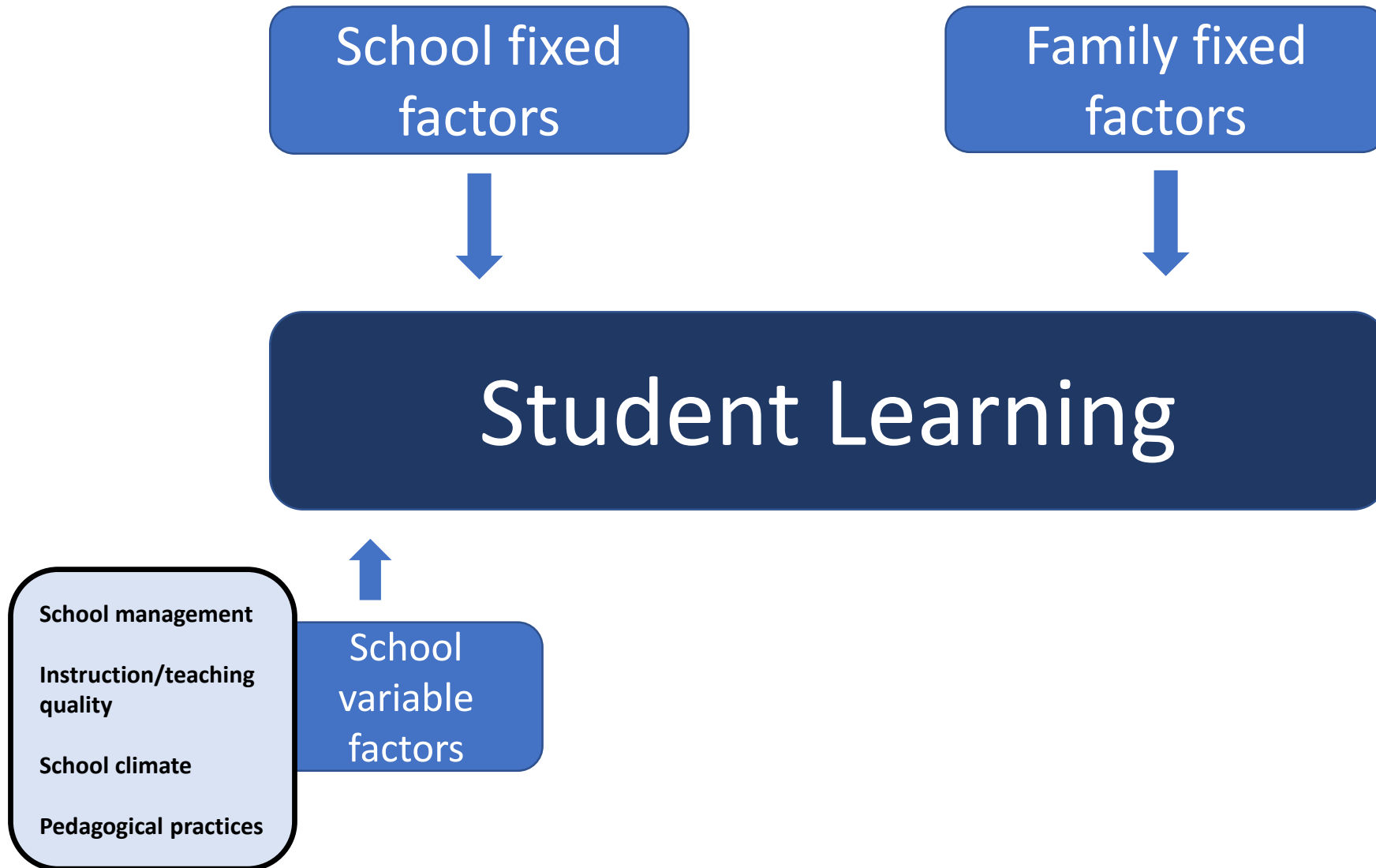
School Production Function



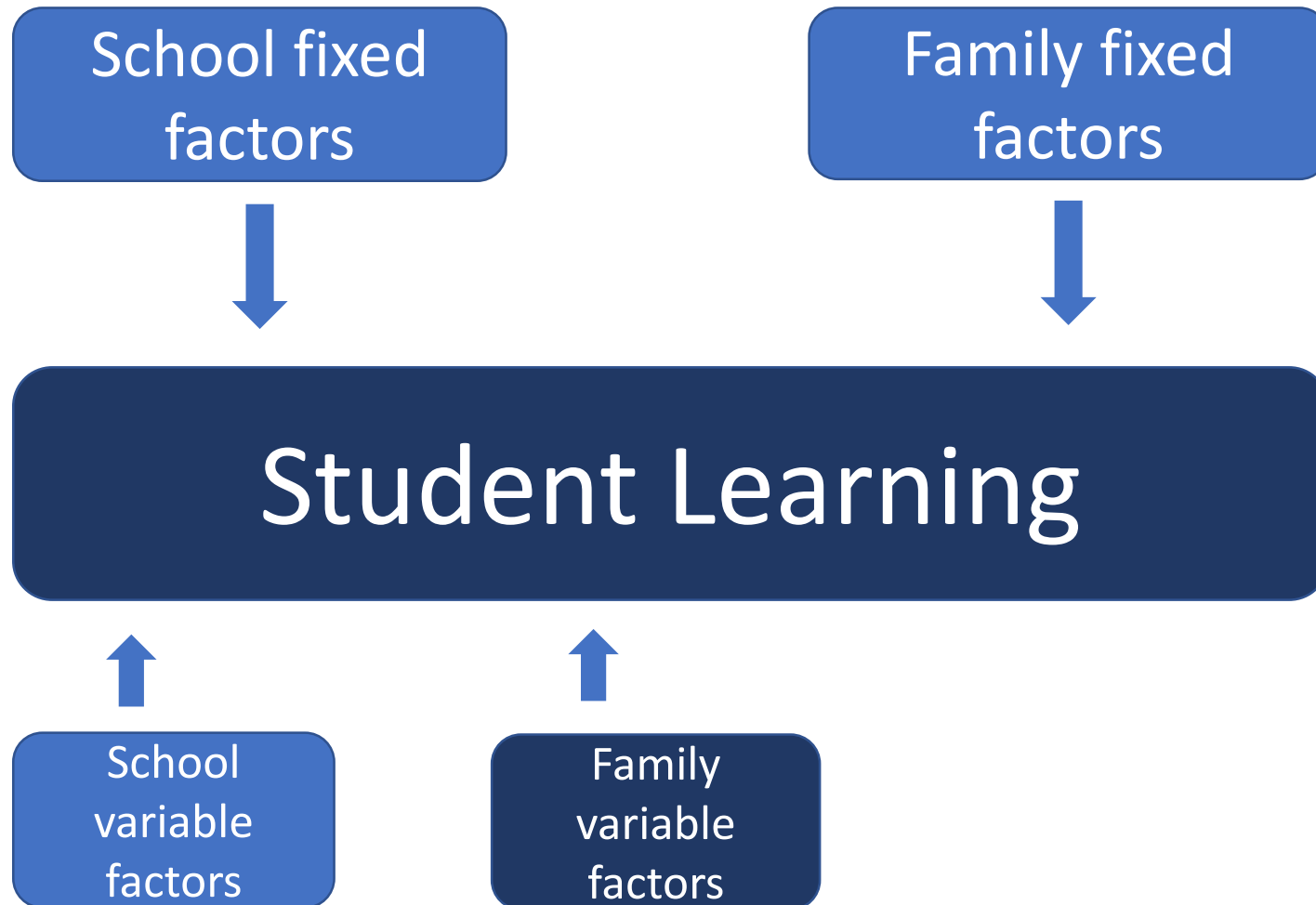
School Production Function



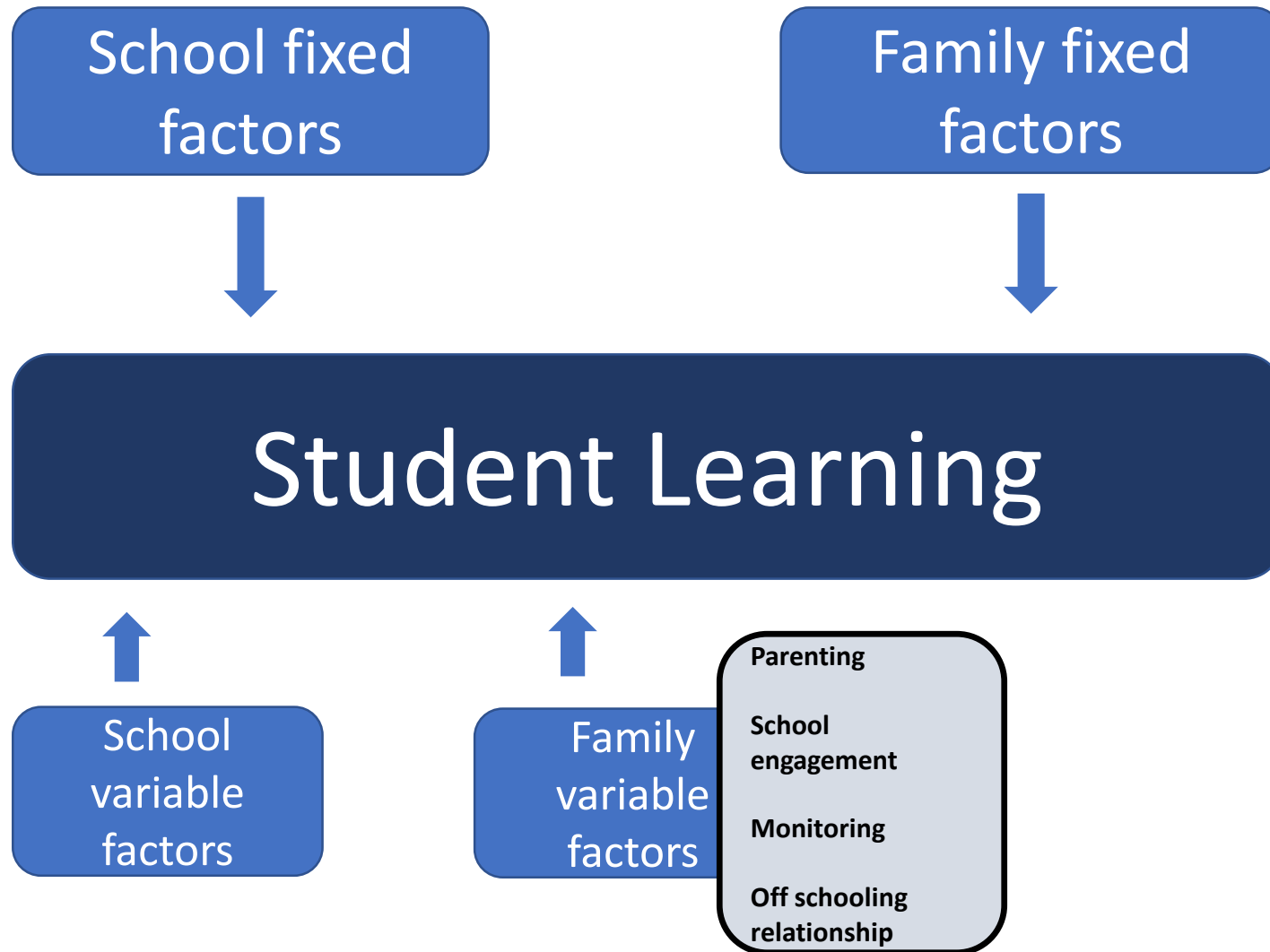
School Production Function



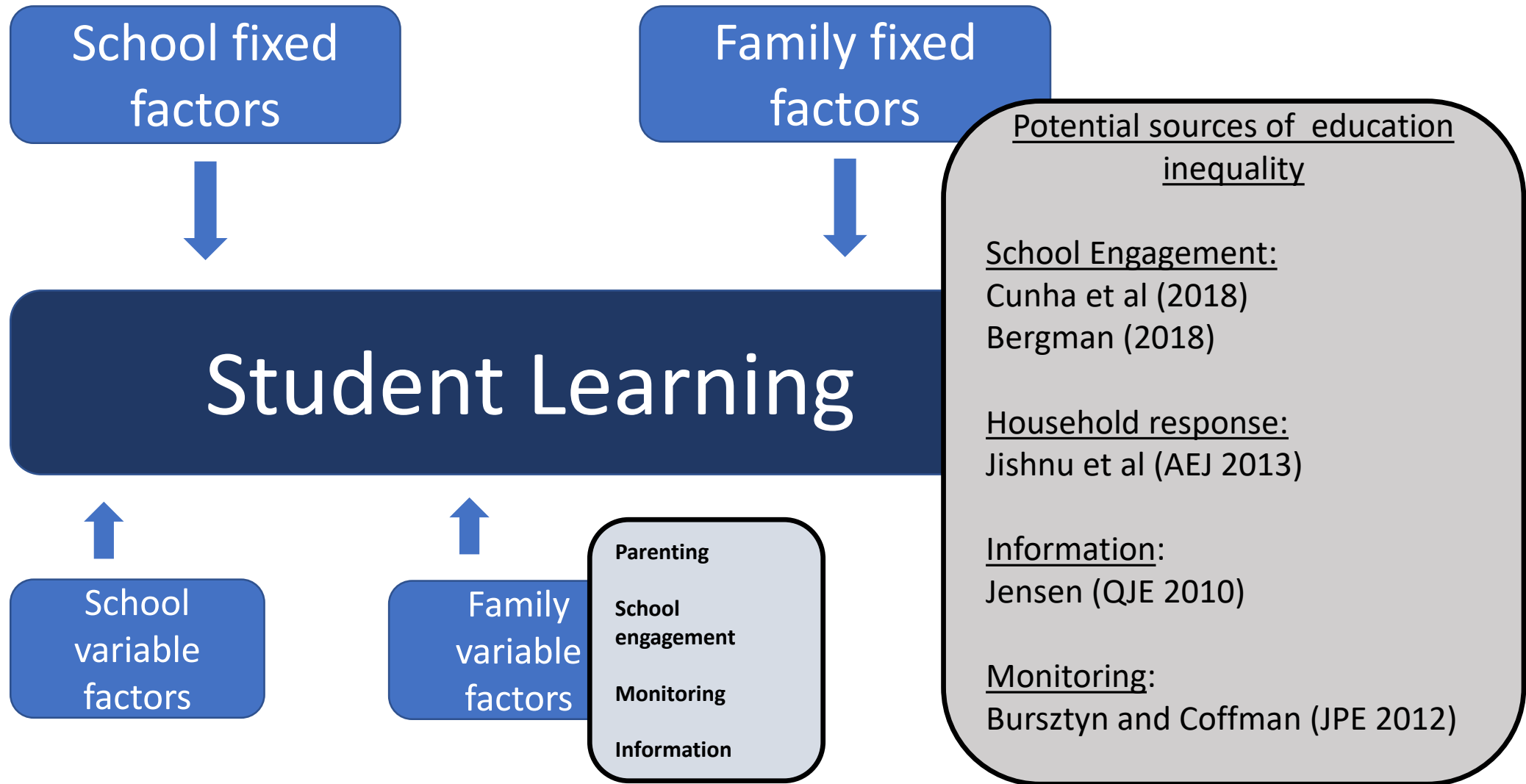
School Production Function



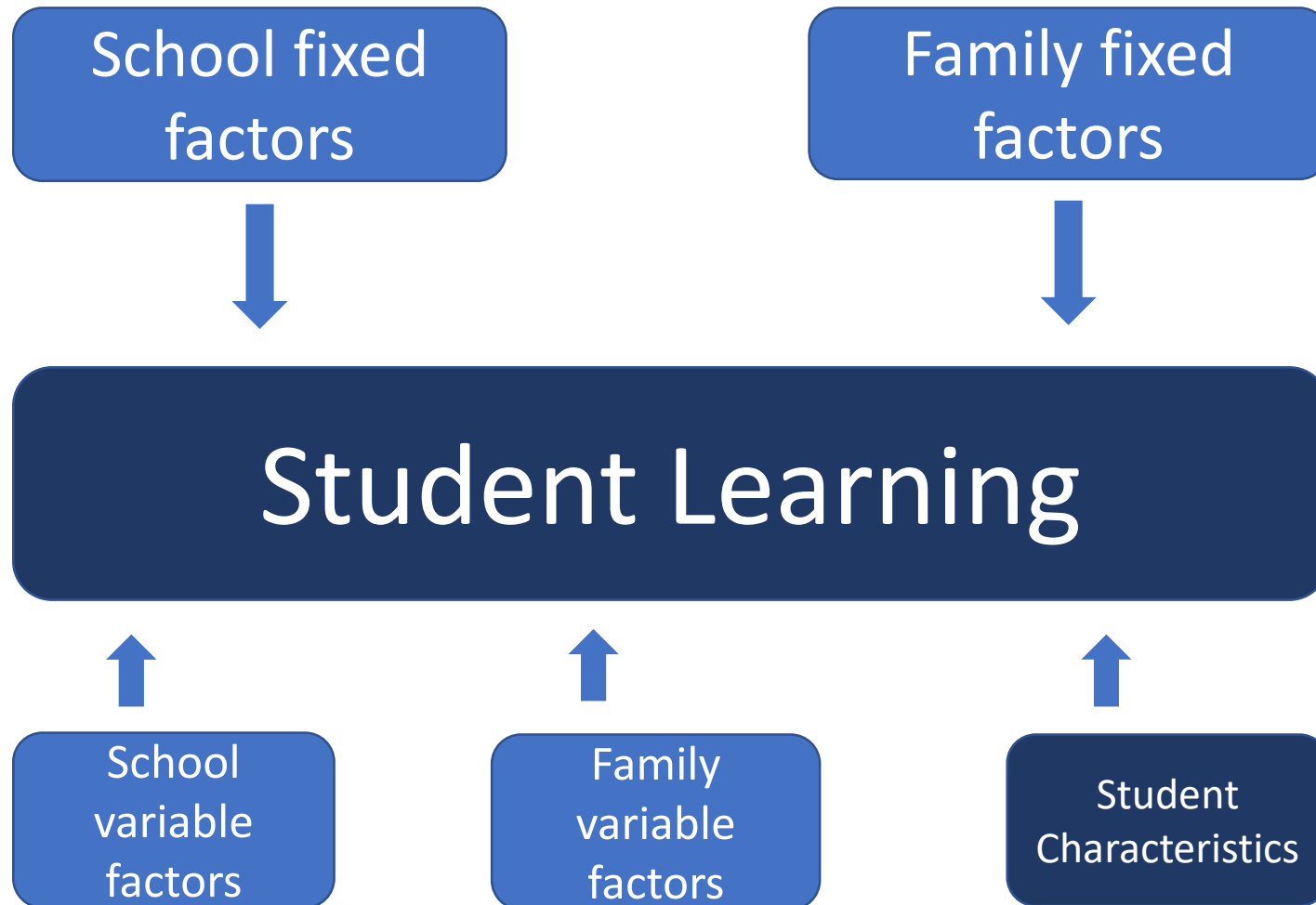
School Production Function



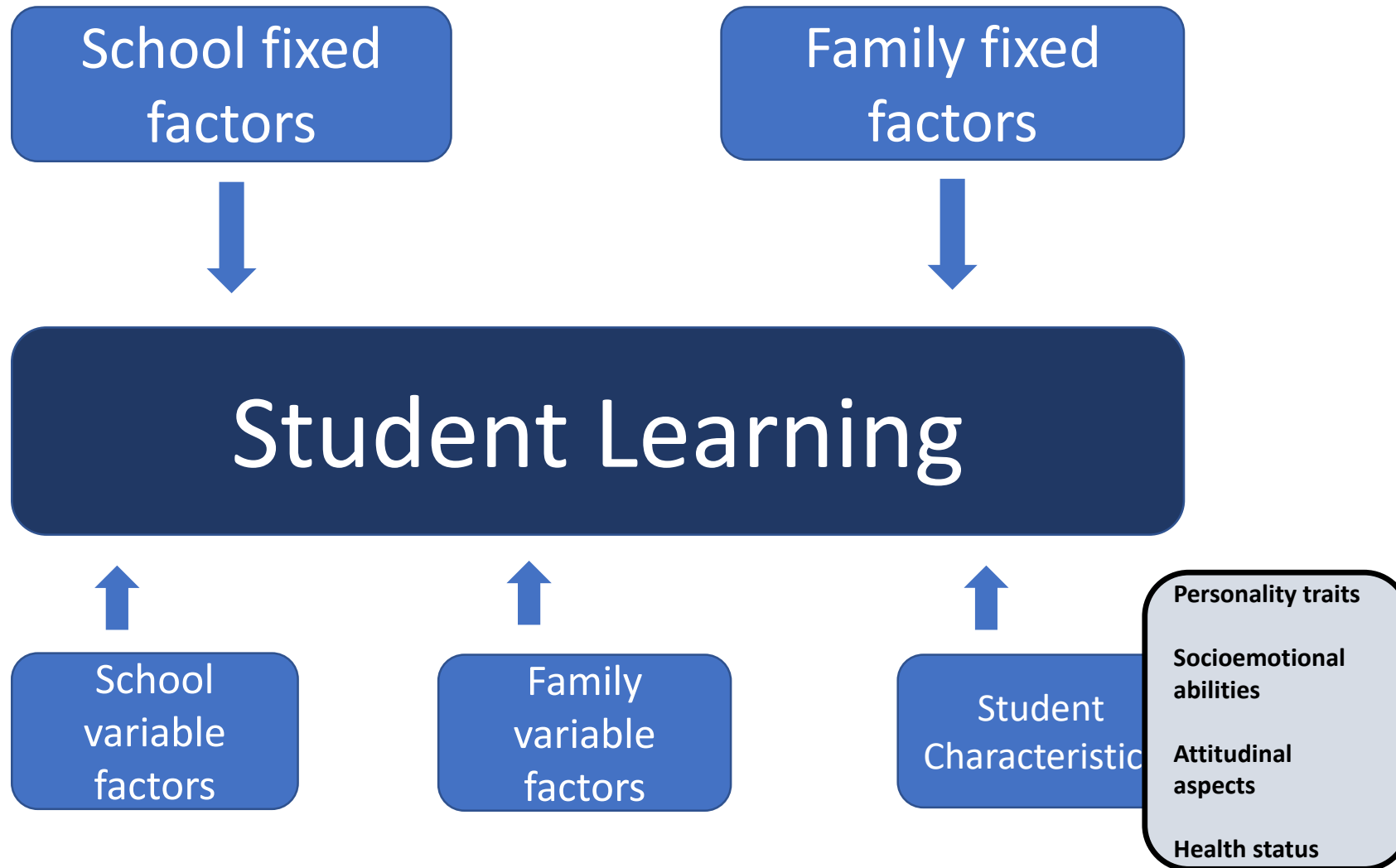
School Production Function



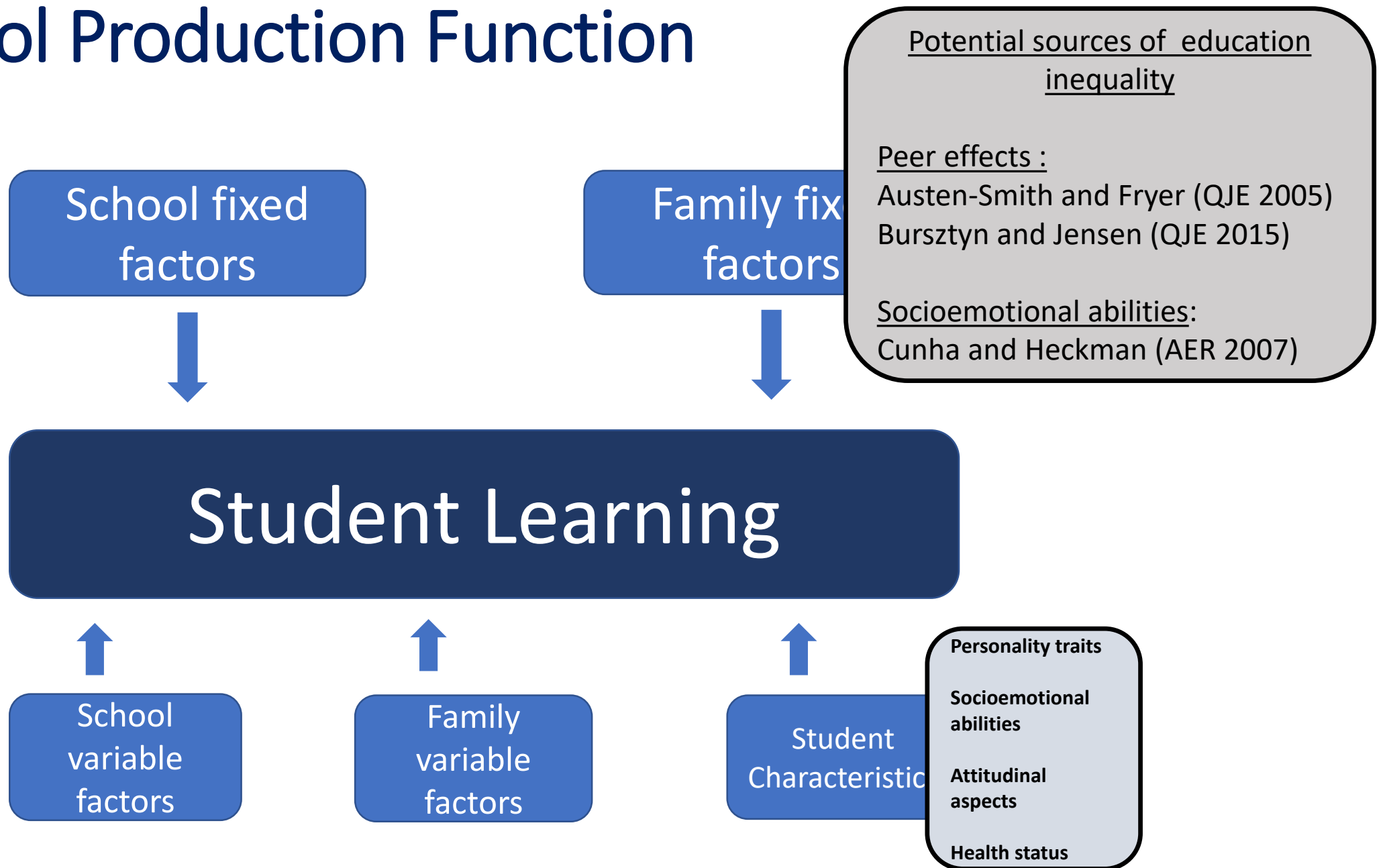
School Production Function



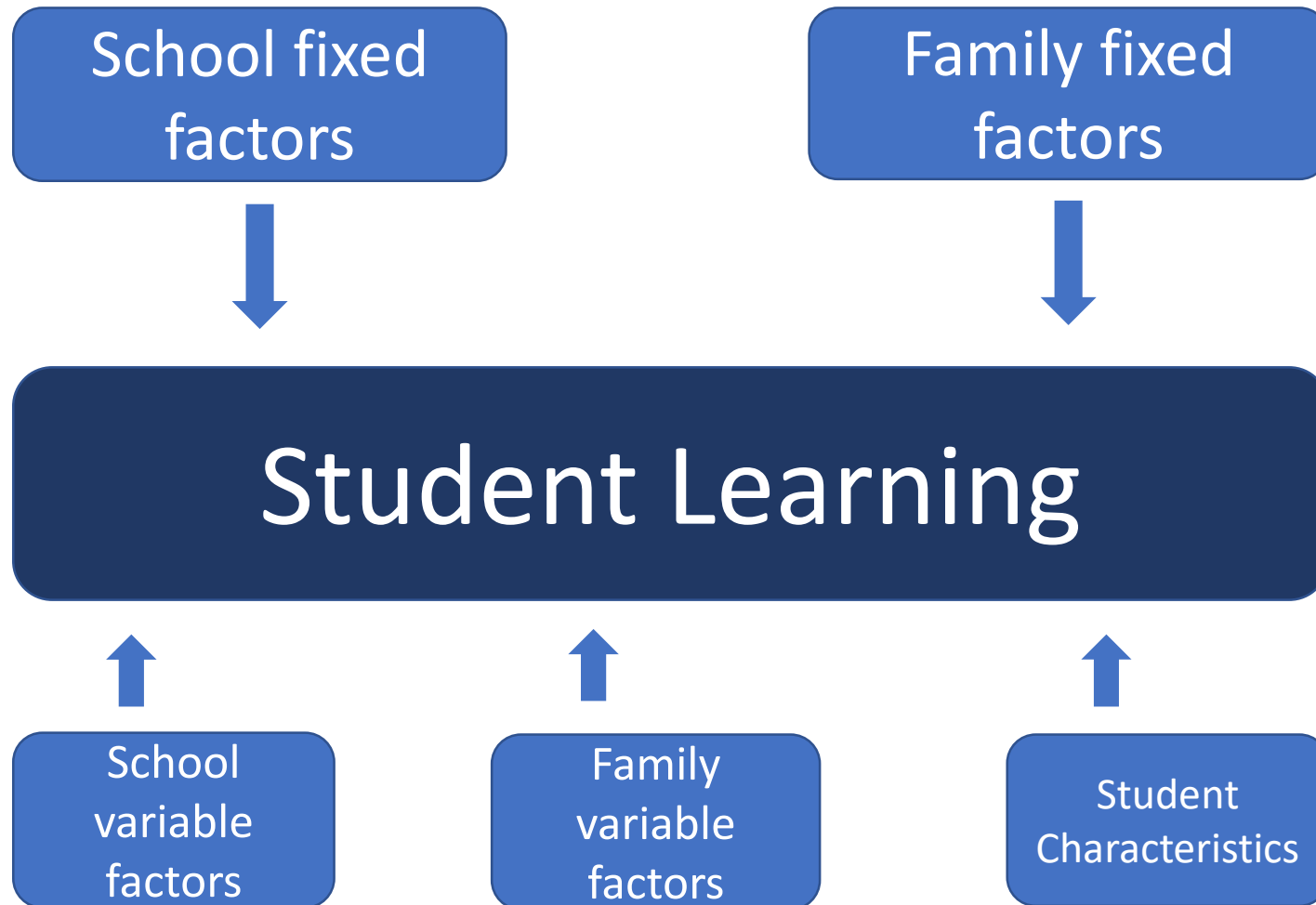
School Production Function



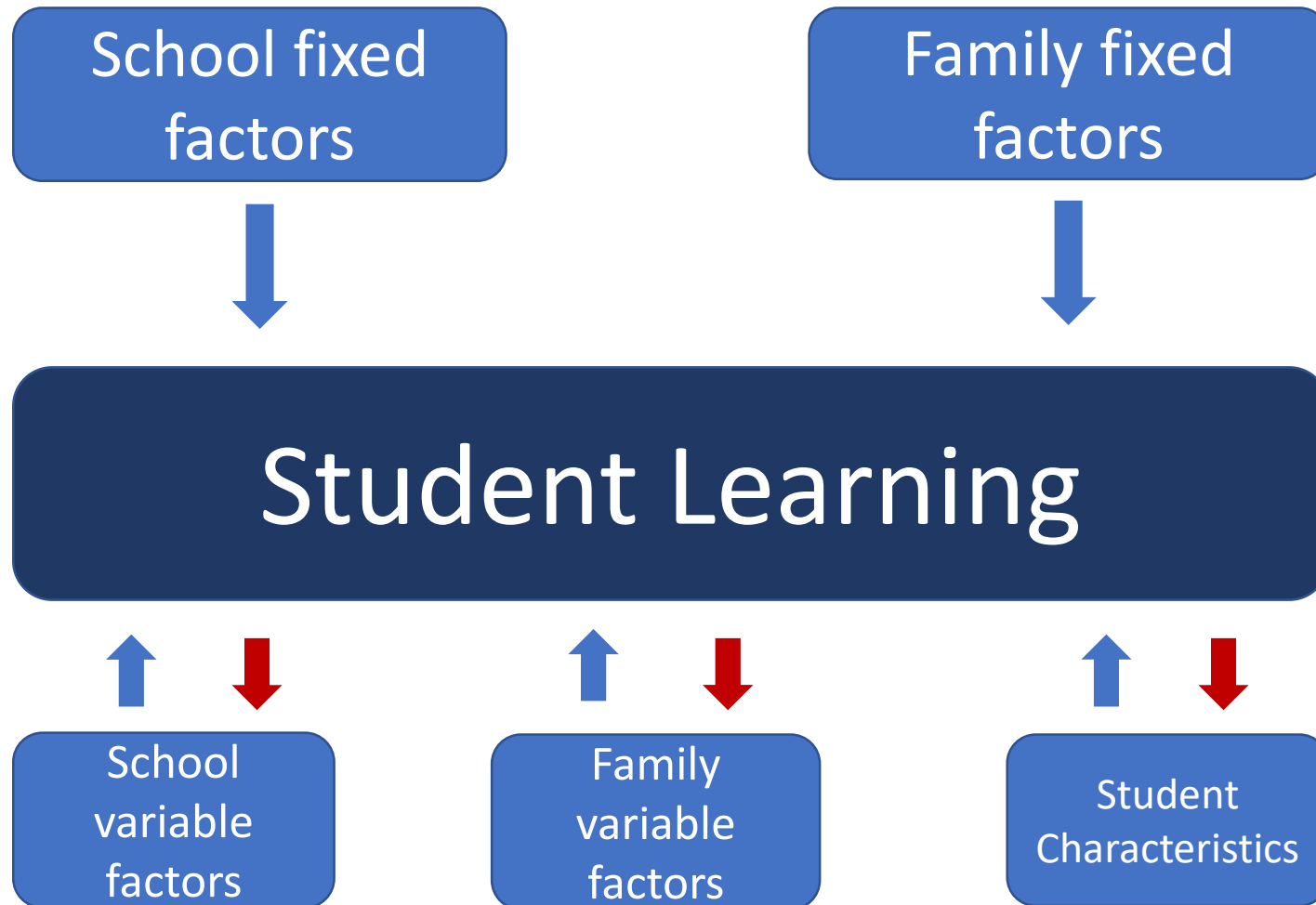
School Production Function



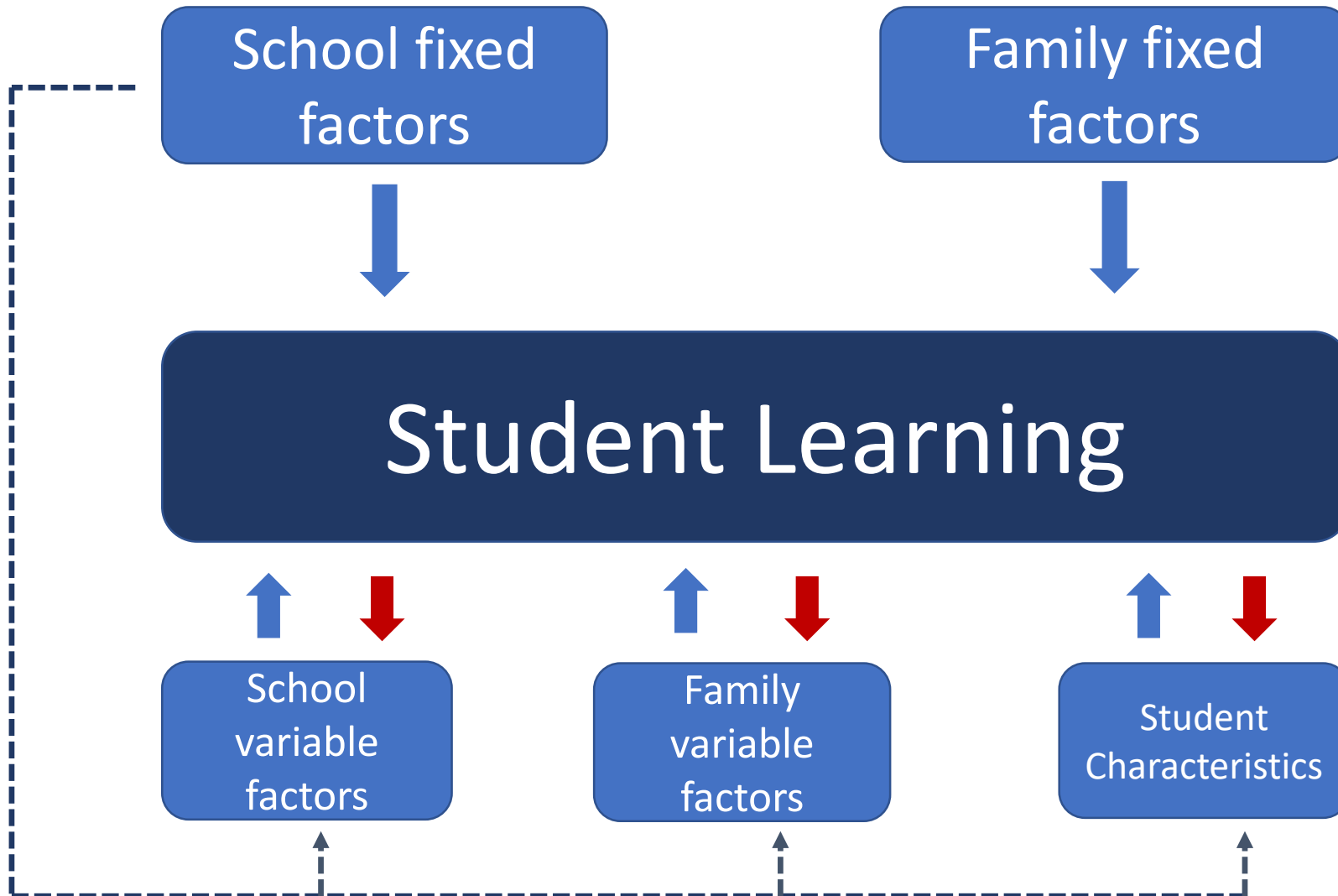
School Production Function



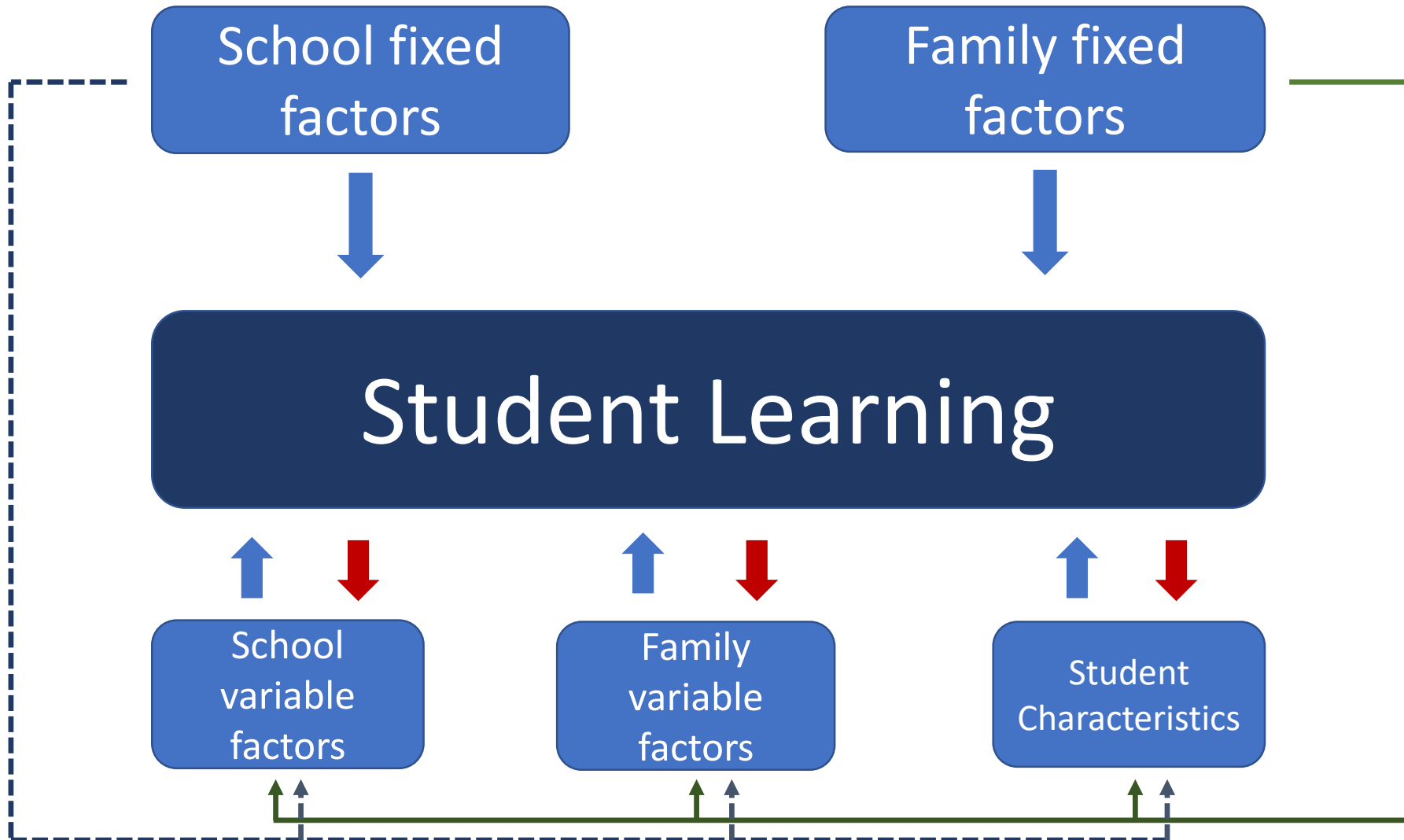
School Production Function



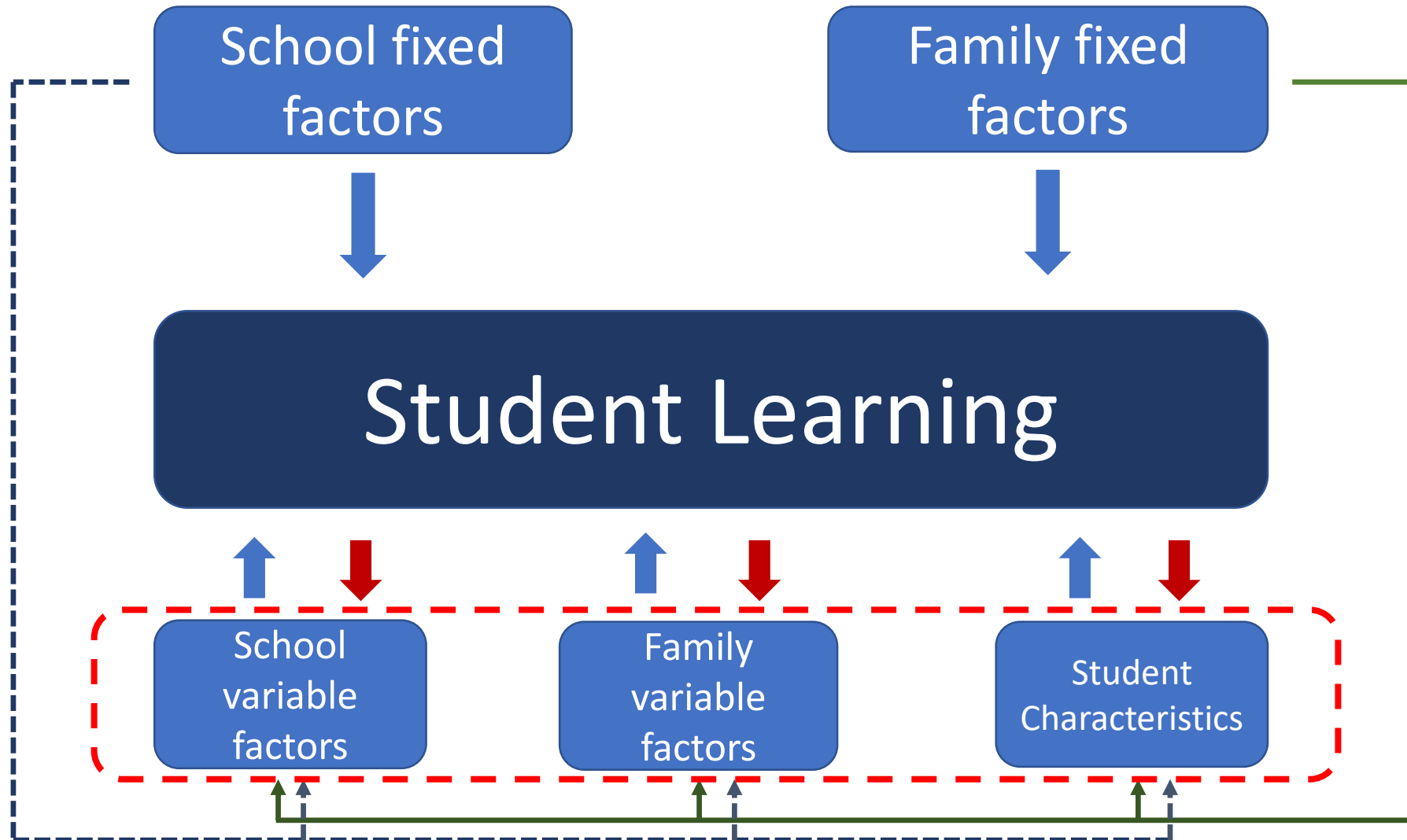
School Production Function



School Production Function



School Production Function

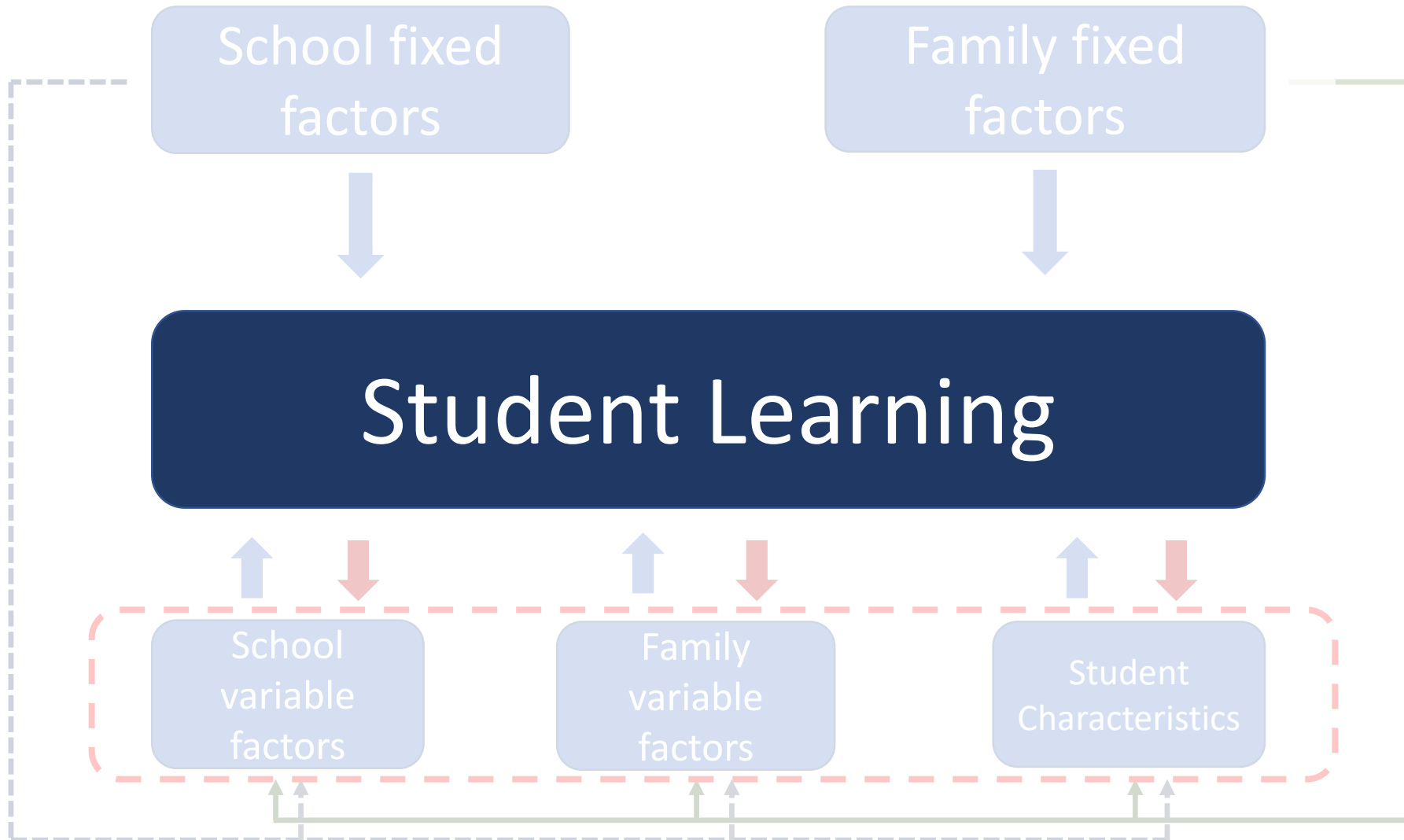


Trends in Attainment Gaps: Longitudinal Micro Data

- We turn to a more careful investigation of prevalence and persistence of the proficiency gap
- Exploring the longitudinal aspect of the data, we computed the proficiency gap evolution over time within students cohorts.
 - *Model 1*: Does not account for differences in the school environment and students' socioeconomic characteristics
 - *Model 2*: accounts for differences in observable socioeconomic characteristics
 - *Model 3*: compares only students in the same school and controls for socioeconomic characteristics

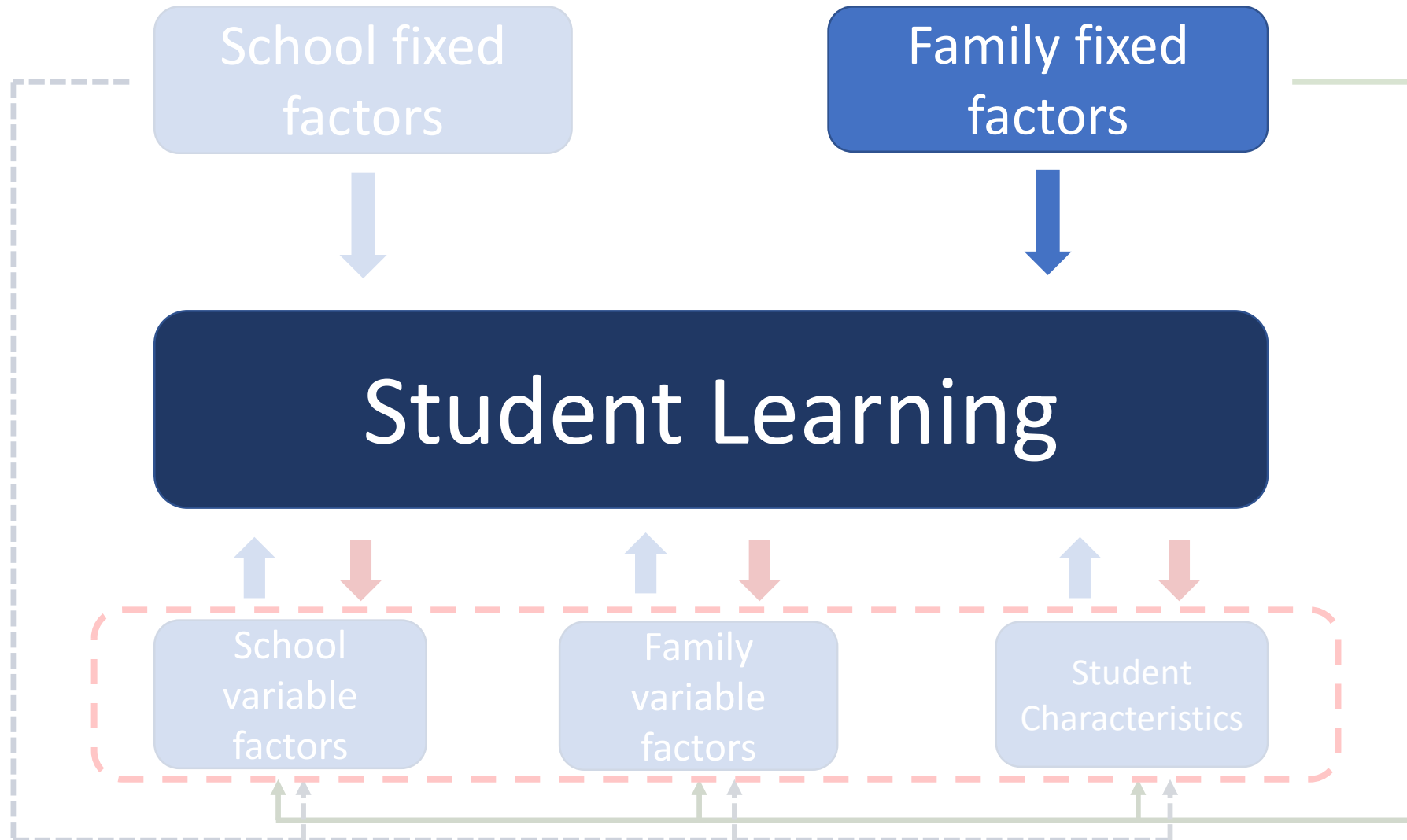
Model 1

Does not account for differences in the school environment and students' socioeconomic characteristics



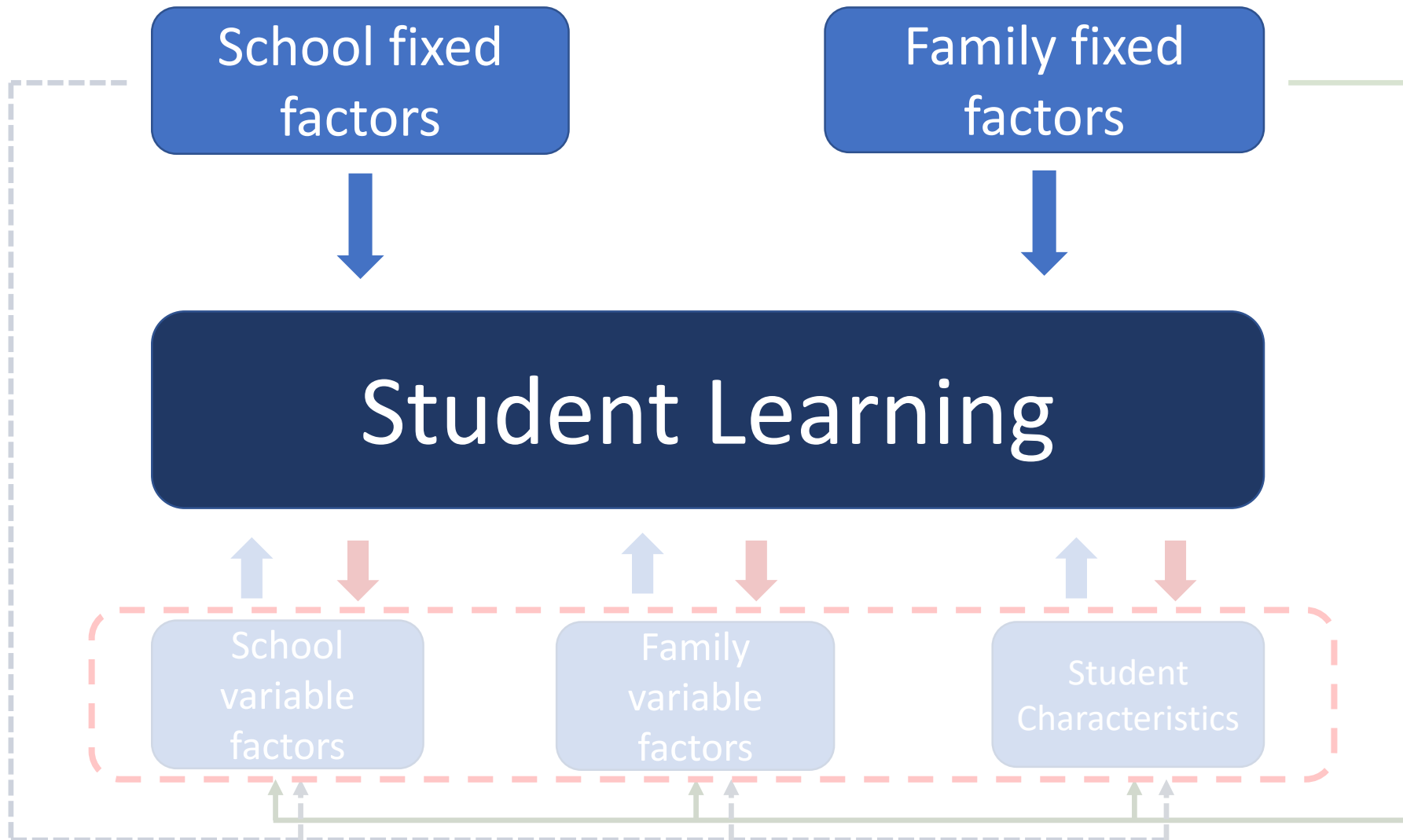
Model 2

accounts for differences in observable socioeconomic characteristics



Model 3

compares only students in the same school and controls for socioeconomic characteristics



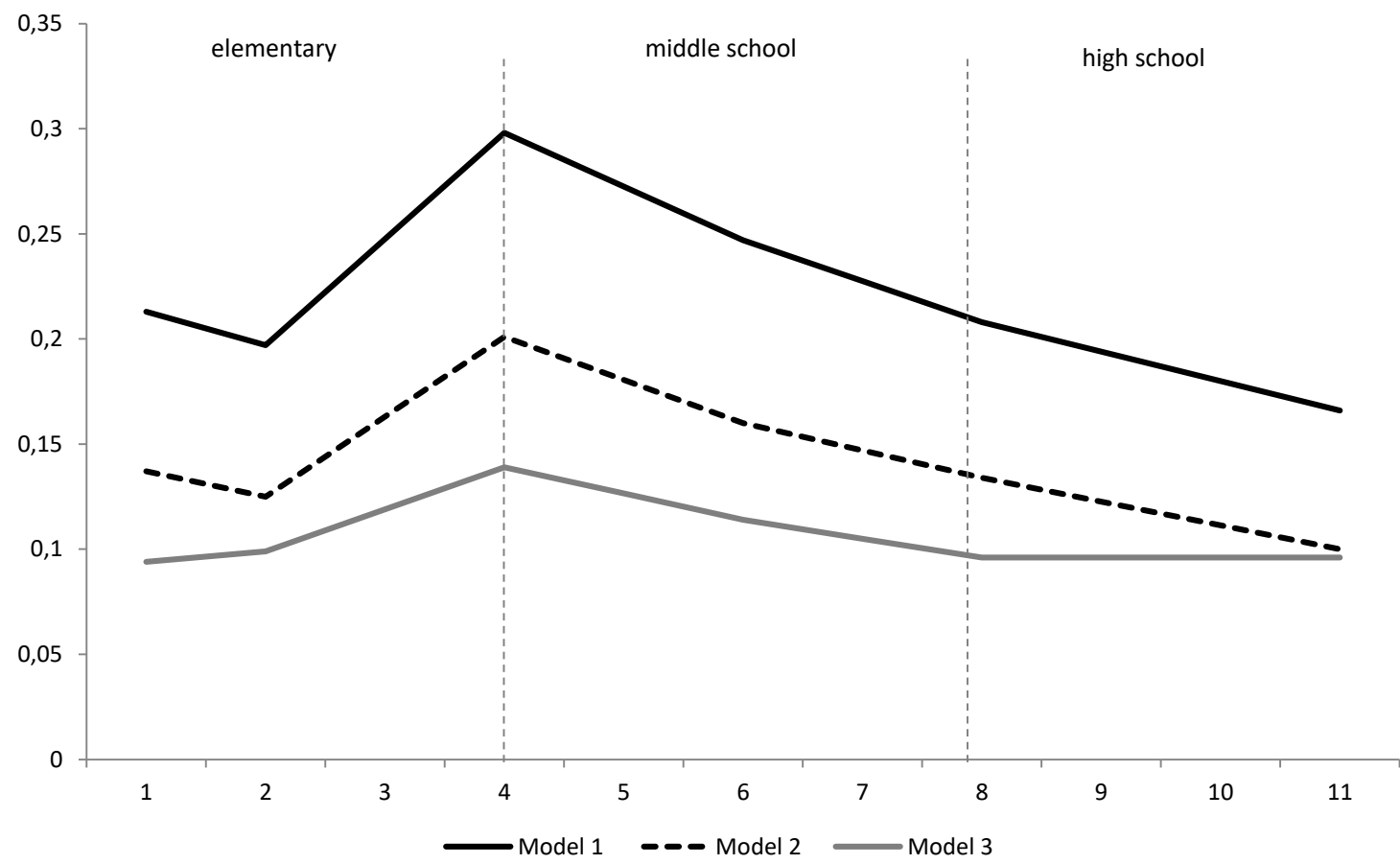
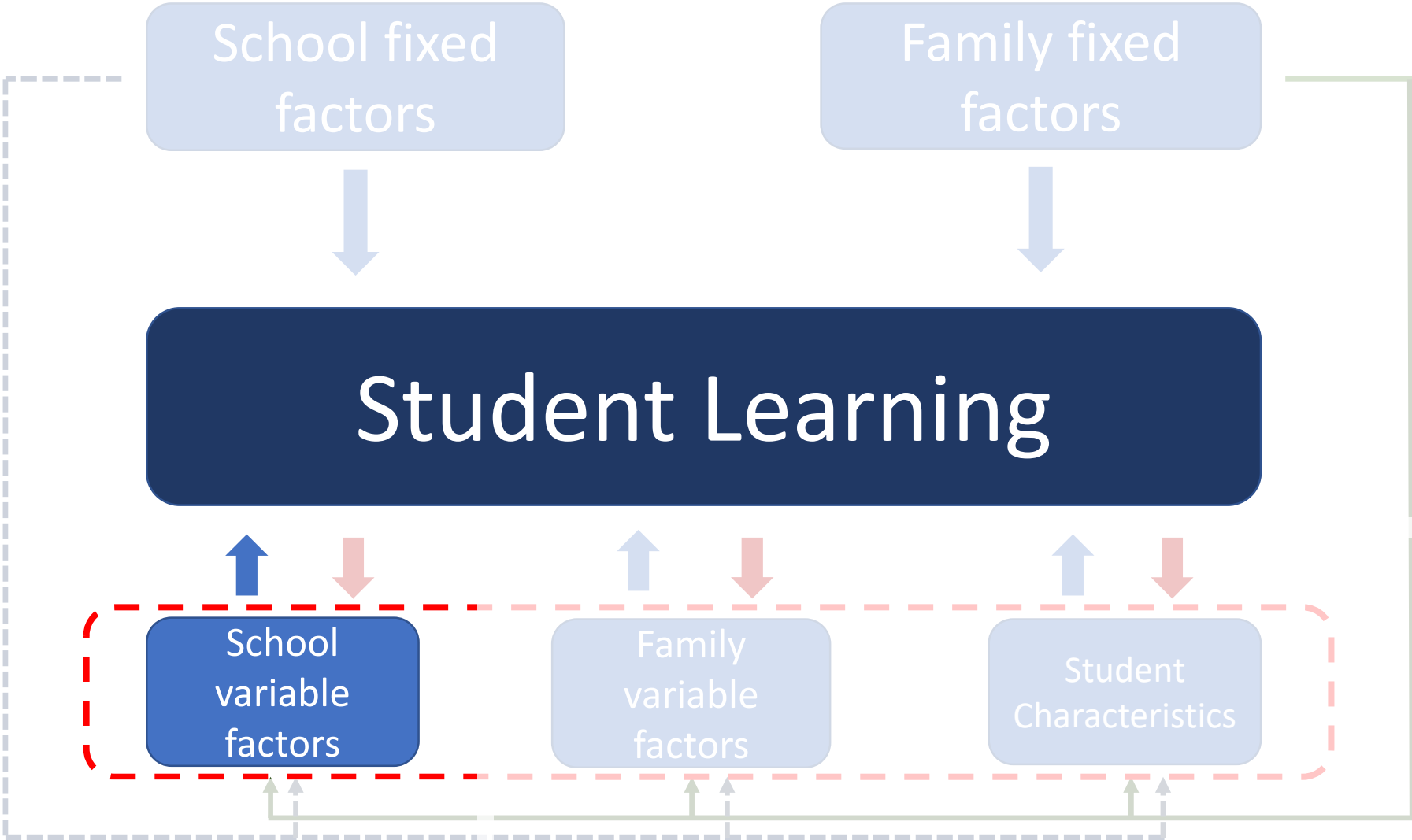


Figure 17: Math Proficiency Gaps (z-scores % of correct answers) over time in school
 Data source: SARESP

Trends in Attainment Gaps: Longitudinal Micro Data

- Even after controlling for school environment and students' socioeconomic background a gap remains for all grades
- The evidence is consistent with a constant gap over time
- Children “bring” the gap to school at the time of entry.
 - Such gap is neither explained away by socioeconomic differences nor eliminated by the training offered in the public schools.
- Usual explanations for the existing racial gap in proficiency, such as differences in school quality, school environment and socioeconomic background explain only about 55% of the gap
- These findings suggest that even if the democratization process eventually closes the secular racial gap in years of education, Blacks will still be lagging Whites in proficiency.
- Big challenge: **design and adopt policies capable of closing these gaps**
- To achieve this goal is necessary to identify the main causes of the proficiency gap (beyond the usual explanations)

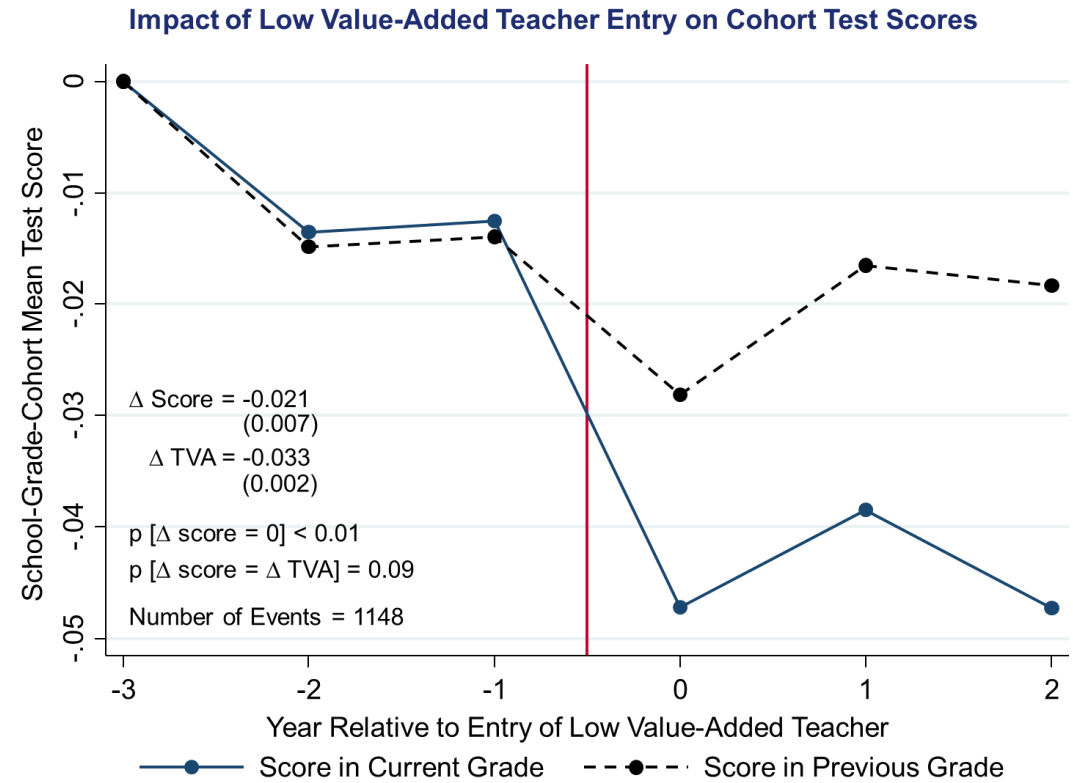
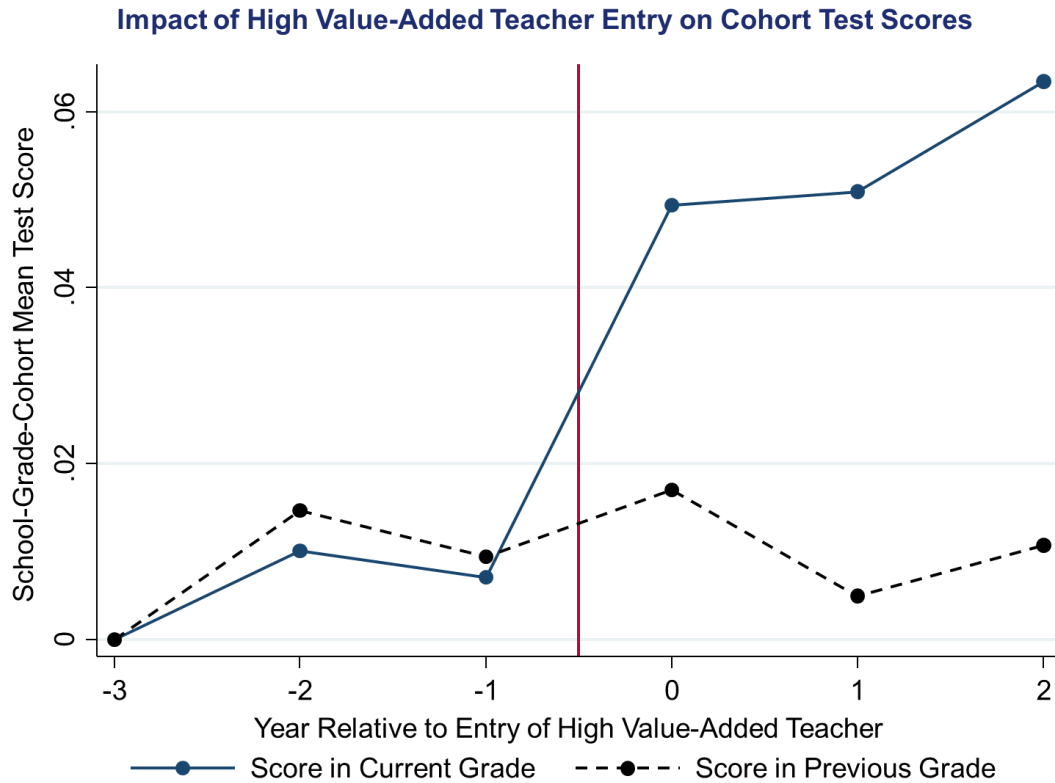
What if teachers treat Black and White students differently?



Why look at teachers?

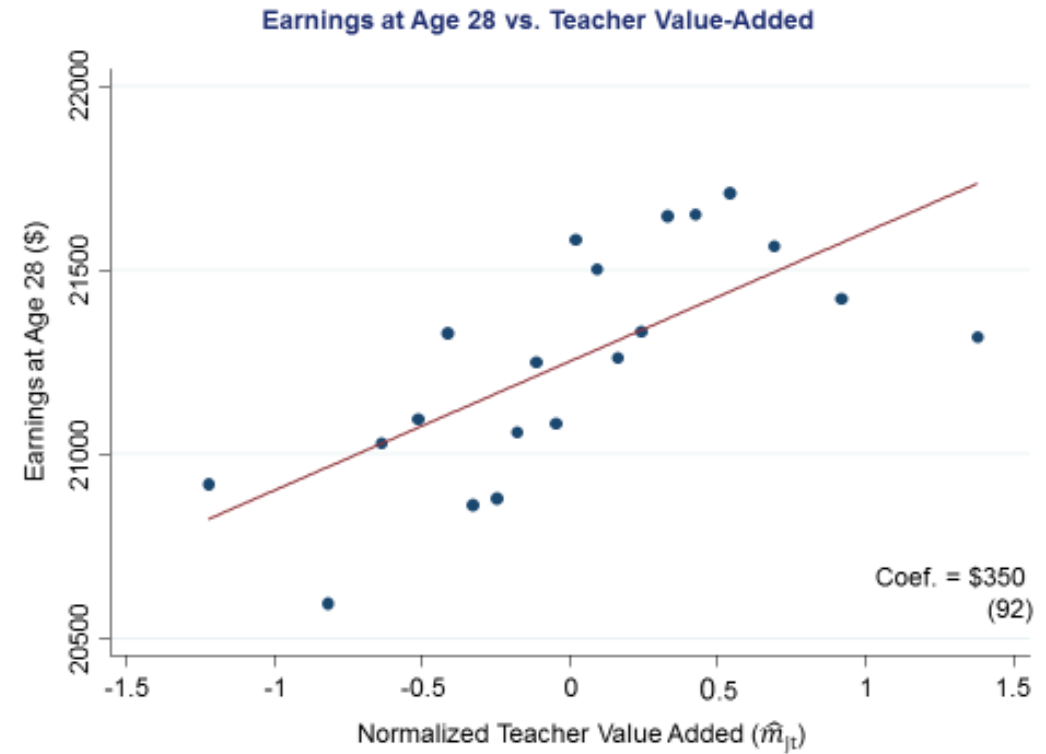
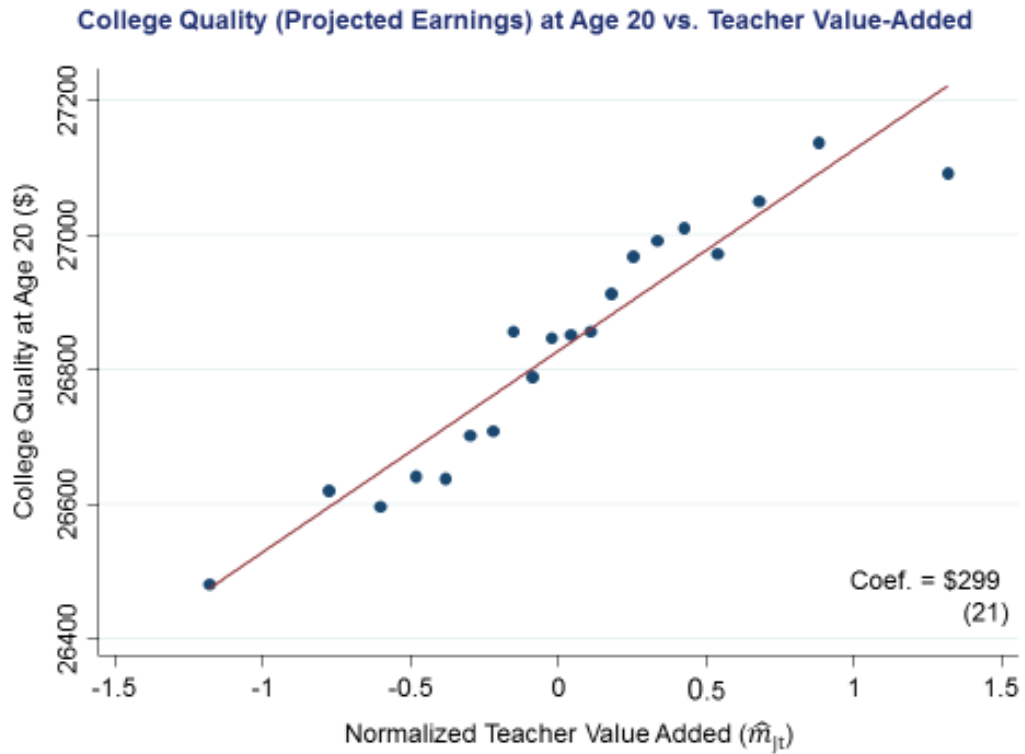
- Teachers effectiveness accounts, on average, for about 30% for the observed variation in students performance.
 - A large set of factors known as the “socio economic status” is the best predictor of student performance.
 - Just too many things are in the SES (health, socio-emotional aspects, parenting...)
 - Very hard to affect (and target) them through education/social policy
 - Teacher “quality” has been shown to be the most relevant single school input.
 - Chetty et al (2014), Araujo et al (2013), Glewwe et al (2013), Hanushek (2014)...

Teacher “quality” on students performance



Chetty et all (2014)

Teacher “quality” on future outcomes

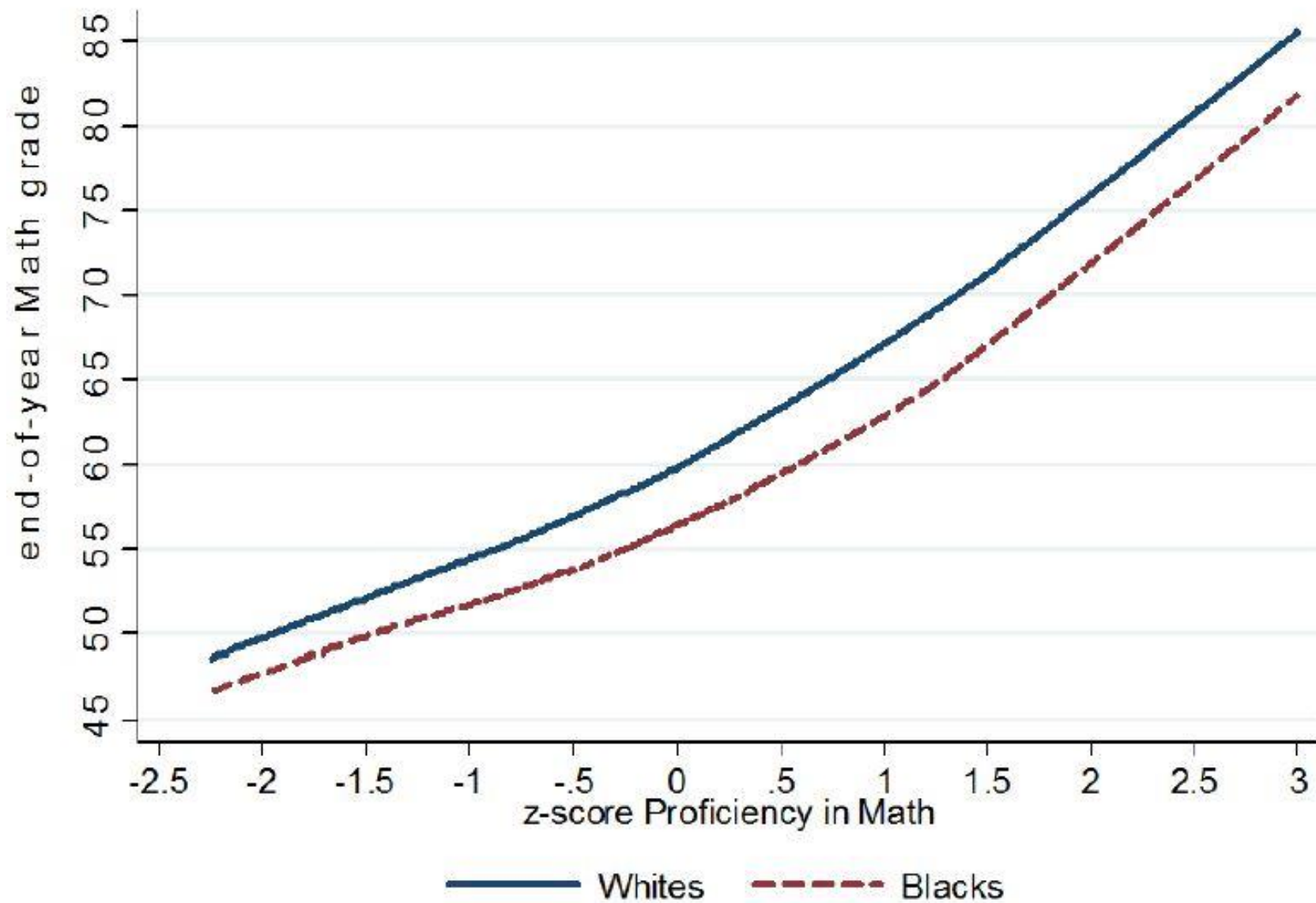


Chetty et al (2014)

Trends in Attainment Gaps: Longitudinal Micro Data

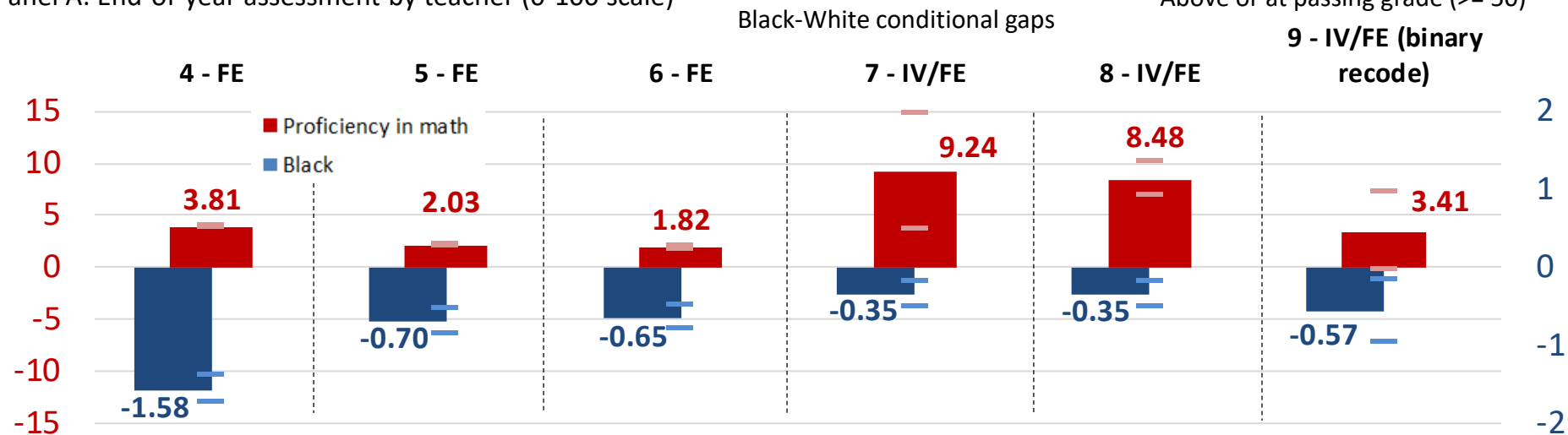
- What if teachers treat Black and White students differently, unfavoring the closing of pre-existing gaps?
 - We combine student-level data on standardized test scores with data on students' report cards in order to tackle this issue.
 - We explore the fact that SARESP's grading is color blind and that the state schools in Sao Paulo adopted an uniform criterion-referenced rule
 - The rationale for the empirical exercises performed here is to see whether White and Black students with the same blindly-graded math score (SARESP) receive different grades

Figure 4. Smoothed Raw Relation Between Proficiency Scores and Teacher-Assigned Grades for 8th Graders.

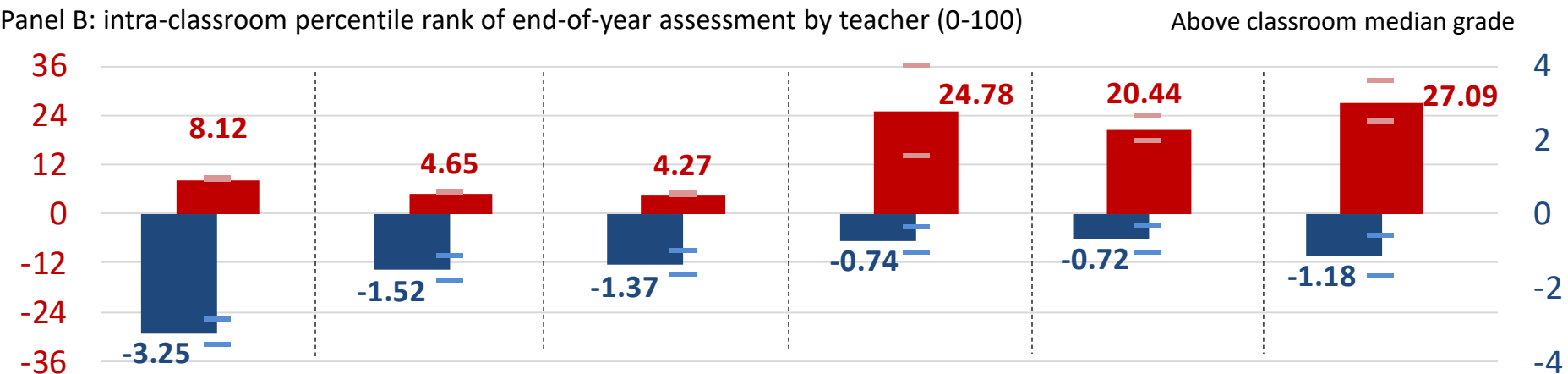


Unconditional and Conditional Racial Differentials in Grading – OLS and IV Estimations

Panel A: End-of-year assessment by teacher (0-100 scale)



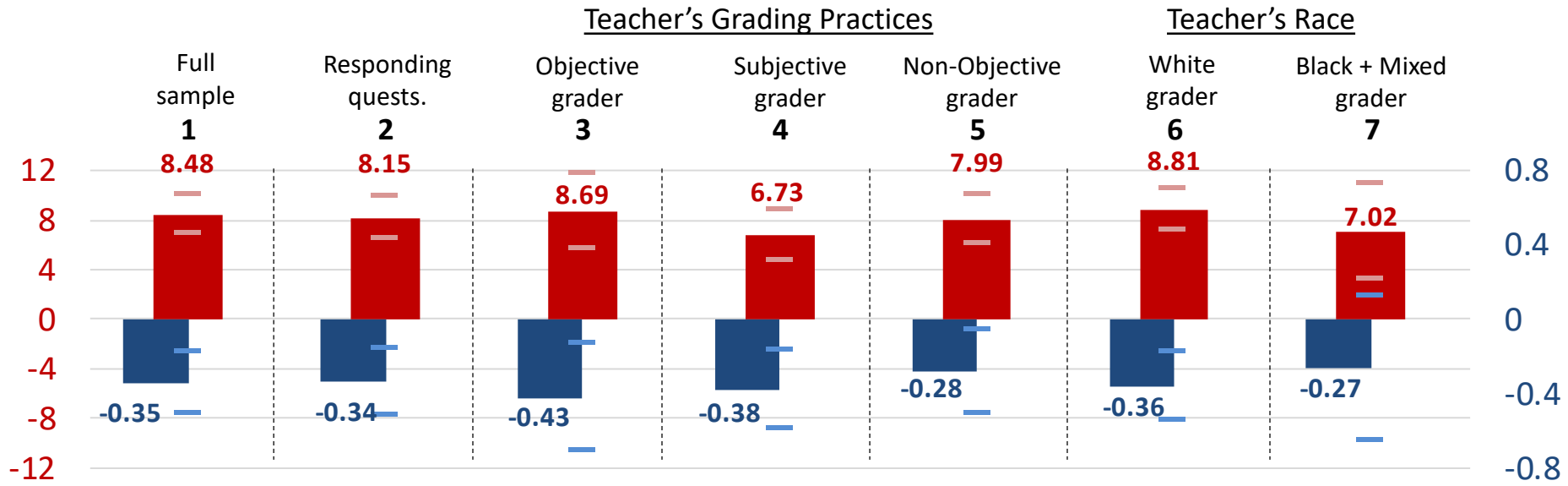
Panel B: intra-classroom percentile rank of end-of-year assessment by teacher (0-100)



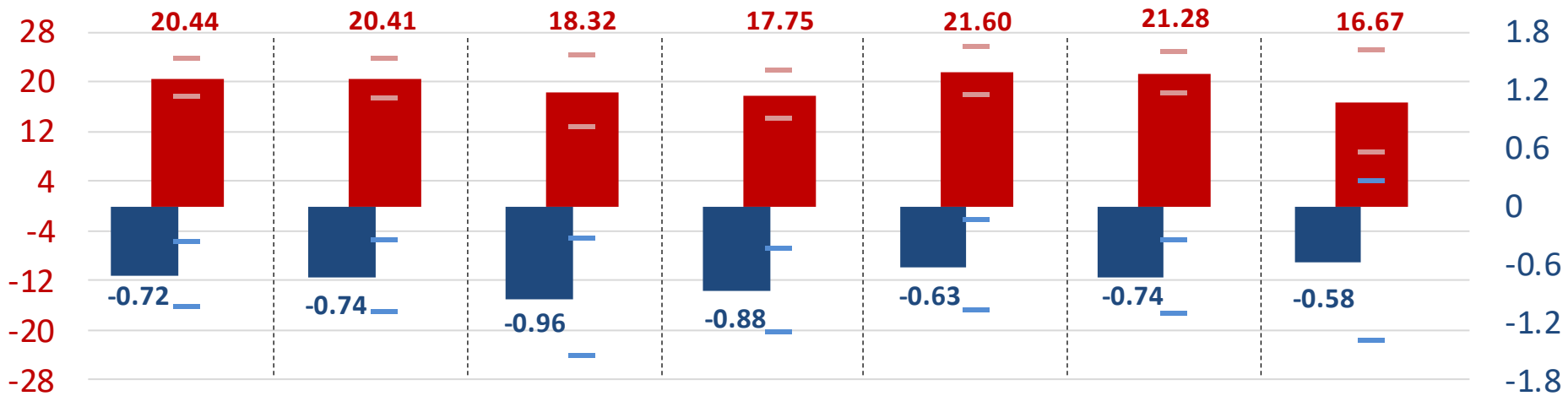
Classroom FE	•	•	•	•	•	•
Child demographics	•	•	•	•	•	•
Performance in std. tests	•	•	•	•	•	•
Family background + 2009		•	•	•	•	•
Math grade			•	•	•	•
Behavioral traits			•	•	•	•
Order of scores' polynomial	4th	4th	4th	4th	3rd	3rd

Conditional Racial Differentials in Grading by Teacher's Evaluation Practices and Race – IV Estimations

Panel A: End-of-year assessment by teacher (0-100 scale)



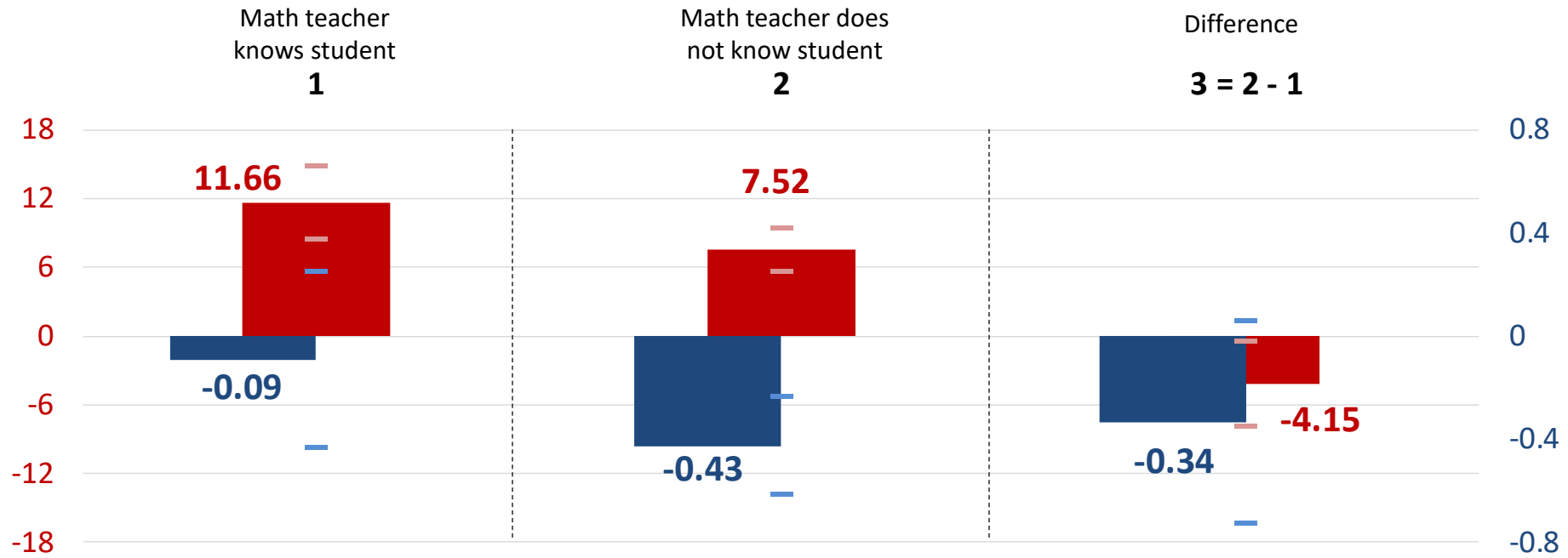
Panel B: intra-classroom percentile rank of end-of-year assessment by teacher (0-100)



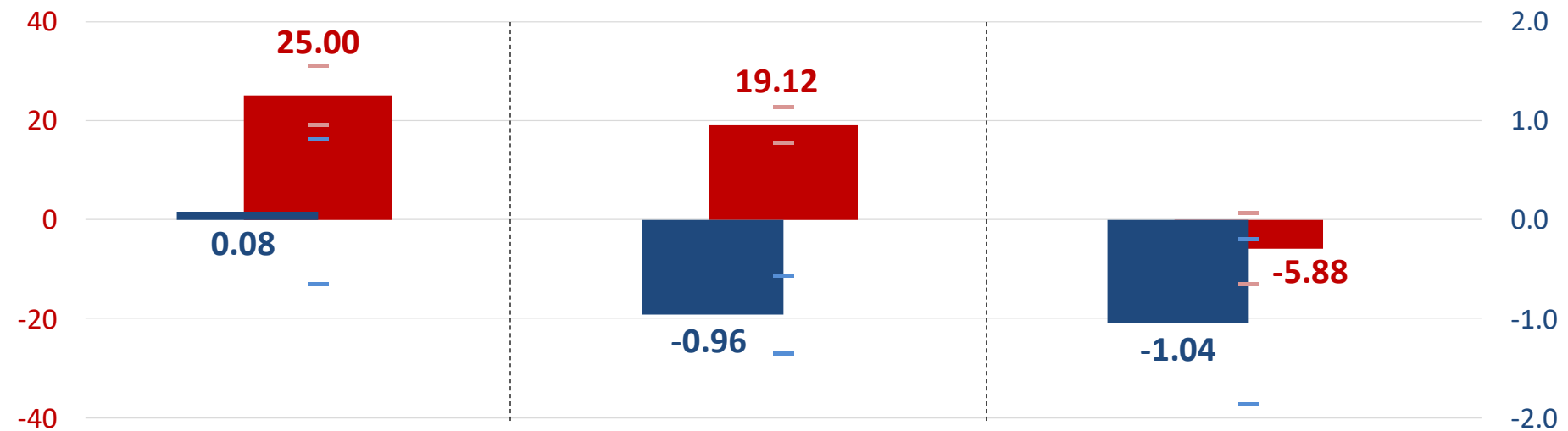
Sample students	277,444	233,750	86,485	171,727	147,846	224,936	52,198
Sample teachers	10,614	8,925	3,305	6,548	5,641	8,596	2,006

Conditional Racial Differentials in Grading and Learning Students' Types – IV Estimations

Panel A: End-of-year assessment by teacher (0-100 scale)

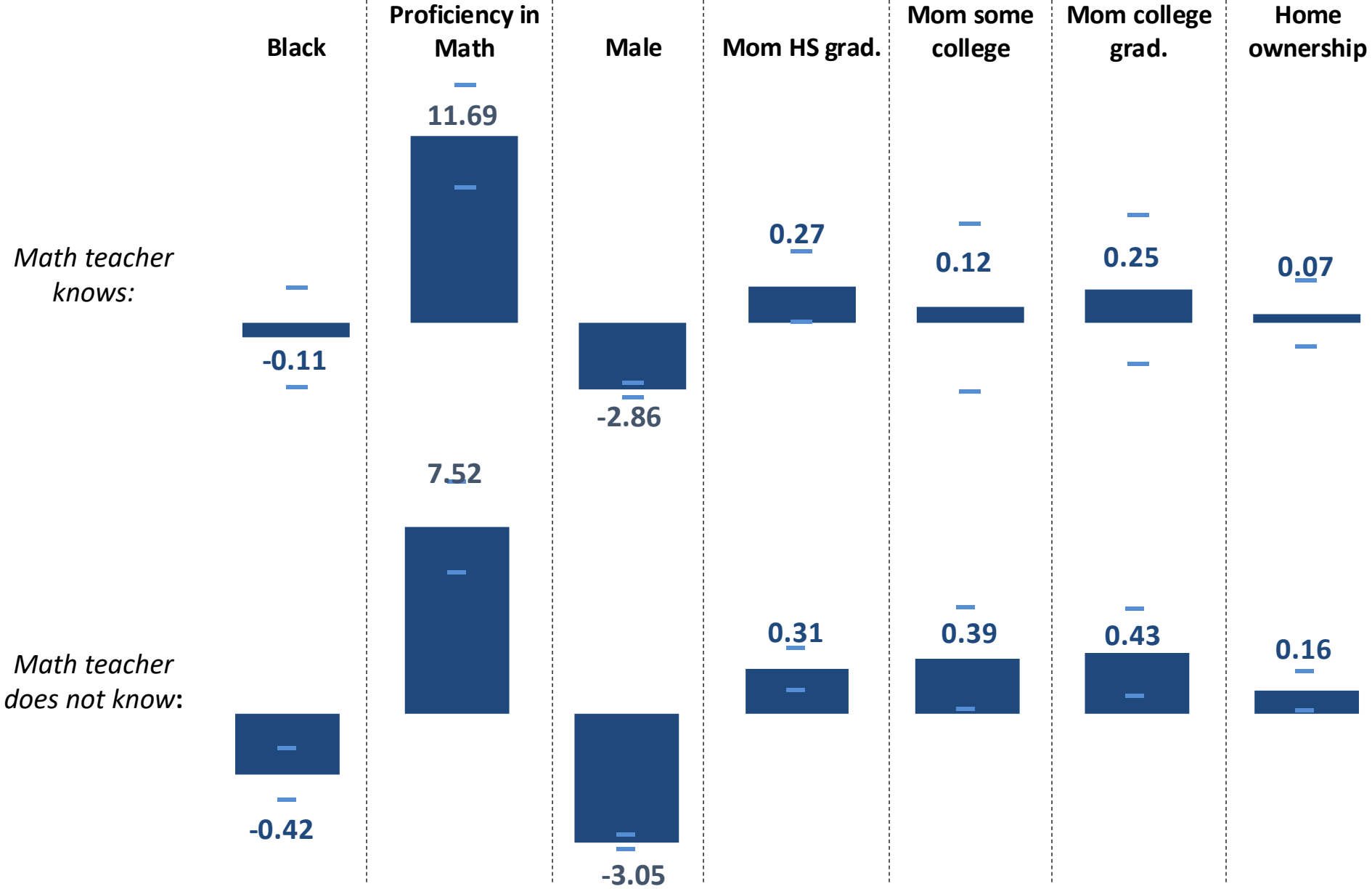


Panel B: intra-classroom percentile rank of end-of-year assessment by teacher (0-100)



Conditional Racial Differentials in End-of-year assessment by teacher (0-100 scale) and Learning Students' Types – IV Estimations for Signals Beyond Race and Interactions with Behavioral Traits

Interactions with SES added



Trends in Attainment Gaps: Longitudinal Micro Data

- There are still differences in assessments that are not explained by the controls
- Blacks are more likely to be under-ranked relative to Whites
- Either an indication of discrimination within schools or that students are different in dimensions (observable by teachers) beyond the ones we are capable of measuring.
 - Our evidence suggest the existence of statistical discrimination against blacks.

Trends in Attainment Gaps: Longitudinal Micro Data

- These results are particularly worrisome in a scenario where parents and children themselves make investment and effort decisions after extracting from school transcriptions signals regarding scholastic abilities.
- Teacher's assessment may also affect key noncognitive aspects of a child's life (such as self-esteem, confidence and motivation)
- Such mechanism could reinforce racial gaps in the accumulation of human capital.

Concluding Remarks

- Much of living standards inequality might be related to education inequality
 - Education is key for intergenerational aspects of inequality
- The school production function provides an useful framework to investigate the potential sources of education inequality
- Employing Brazilian (macro and micro) data we show robust evidence that statistical discrimination might explain part of the education racial inequality in Brazil.

Thank You

Ricardo A. Madeira

rmadeira@usp.br